Indus Journal of Social Sciences

Online ISSN: 2960-219X
Print ISSN: 2960-2203
Volume 4, Number 1, 2026, Pages 907 – 932
Journal Home Page
https://induspublishers.com/IJSS/about

Stress and Safety in Digital Aviation: Ground Employee Experience, Technology Driven Work Environment

Ali Shahbaz[1], Hafiza Mahnoor Khalid[2], Shahid Mahmood[3]

[1-3]*University of Management and Technology, Lahore, Pakistan*

ARTICLE INFO

Article History:

Received:	*January*	*14, 2026*
Revised:	*February*	*20, 2026*
Accepted:	*February*	*25, 2026*
Available Online:	*March*	*07, 2026*

Keywords:

Aviation ground employees, Techno-stress, Occupational stress, Safety performance, Job demands-resources

Corresponding Author:
Shahid Mahmood
Email:
shahid-mahmood@umt.edu.pk

ABSTRACT

This study investigates the relationships between digital technology usage, stress, and safety performance among aviation ground employees in Pakistan's technology-driven work environments. The research is primarily grounded in the Job Demands-Resources Model, and secondary supported by the Transactional Theory of Stress and Techno-stress Model, the research examines five key constructs: digital technology use (independent variable), techno-stress and occupational stress (mediators), job resources and support (moderator), and safety performance (dependent variable). Data were collected from 220 ground employees across Pakistani airports using a structured questionnaire with six sections measuring demographics, technology usage, techno-stress, occupational stress, job resources, and safety performance. Analysis was conducted using Smart PLS for structural equation modeling (PLS-SEM), including reliability and validity testing (convergent and distinctive), path analysis, and mediation-moderation examinations. Findings indicate that digital technology use is significantly and positively associated with both techno-stress and occupational stress. However, only occupational stress significantly and negatively influences safety performance, whereas techno-stress does not have a significant effect. Occupational stress serves as a mediator in the relationship between technology use and safety performance, but techno-stress does not mediate this relationship, and the proposed serial mediation pathway is not supported. Job resources and support do not significantly buffer the detrimental effects of either techno-stress or occupational stress on safety performance. Overall, the model explains a modest portion of the variance in safety performance. Practically, the findings inform aviation organizations in implementing technology training, stress management programs, and supportive supervision. For regulators, results support policies integrating employee wellbeing into safety management systems. Future research should employ longitudinal designs, include objective measures, and examine cross-cultural comparisons to extend these findings.

Introduction

1.1 Background of the Study

In the contemporary era, advanced technology is playing an inevitable role in the reshaping of aviation ground operations. These consistent tools are many, like real-time tracing systems, digital technologies, and AI. Merging operational activities with technology provides safety and helps increase productivity. Nevertheless, the swift digital transformation has brought different issues for ground staff who handle safety checks, customer service and cooperate with many functional units [1-3].

Technology enabled workstations have caused a dilemma for ground employees in two aspects. The combination of these challenges and traditional occupational stressors is an important cause of increased stress such as heavy workloads, inadequate resources, and ambiguity in playing roles. Most studies reported the adverse effects of stress on the employees' behavior, adherence to correct procedures [4-6].

Safety is the prime concern in aviation ground operational activities, where human-error leads to severe consequences. The case study of the International Air Transport Association suggested that annually, $5 billion could be saved by preventing ground damages; even this figure will be doubled in 2035 unless current practices and systems are significantly improved [4]. So, the implementation of Safety-Management systems has become an essential requirement under the International Civil Aviation Authority standards for recognizing hazards and managing risk. It would help the organization to create a safety culture and encourage employees' well-being [7, 8].

Stress critically influences safety in high-tech aviation. Lack of job resources diminishes work performance by reducing employee engagement and compliance with safety procedures—effects particularly relevant to Pakistan's modernizing aviation industry. Aviation contributes 3.2% to national GDP through 28 passenger airports. Pakistani ground workers face heavy workloads, limited benefits, and low salaries [9-11].

1.2 Problem Statement:

Though the aviation industry has broadly accepted technology-driven ground operations in recent years, there is limited knowledge concerning the cumulative impact of these technology-driven workplace environments on stress levels and resultant safety among ground aviators. The above research gap has been observed primarily in developing economies, such as Pakistan, where the aviation industry has modernizing infrastructure but limited research on employee well-being [12, 13].

Several factors influence employee stress: overlapping traditional stressors (workload, time pressure, role ambiguity) and technology-specific stressors (overload, complexity, uncertainty); safety-critical consequences of impaired performance; rapid digital change overwhelming adaptability; and organizational factors (safety culture, resource availability) that can buffer stress effects [9, 14, 15].

This research focuses on two main questions: what kind of a balance exists between stress and safety in techno stress work among ground aviation employees? and how do other factors affect this relationship? [8, 16].

1.3 Research Aim and Objectives:

1.3.1 Aim: The objectives of this research will be to examine the interplay between occupational stress and safety protocols within Pakistan modernize ground handling sector furthermore it aims to determine the key drivers affecting workers interaction with digital aviation platforms.

1.3.2 Objectives:

1. Determine the levels of occupational and techno-stress experienced by the ground staff of the aviation industry working in technology-driven environments.
2. To investigate the correlation between stress level and safety performance among ground handling employees.
3. Research into the impact of the adoption and use of information technology upon ground staff stress levels.
4. A study of the modernization effect of safety culture and organizational support on the stress and safety relationship.
5. To identify job resources and demands, which can impact ground employees in a digital aviation environment.

1.4 Research questions

This research tries to answer the following questions:

RQ1: How much work stress and technology related stress to ground workers in high tech aviation jobs actually face?

RQ2: In what ways does stress (occupational and techno-stress) influence safety behaviors and safety outcomes among ground staff?

RQ3: What is the relationship between the intensity of digital technology use and the level of employees' stress?

RQ4: Can things like good safety culture, helpful managers or better tools reduce the bad effect that stress has on safety?

RQ5: which specific job pressures and which type of support are main causes of stress in safety issues for ground staff ?

1.5 Theoretical Framework

This research is grounded in three crucial and enduring theoretical frameworks that briefly explain the relationship among technology, stress, and safety to help people feel comfortable [18].

1.5.1 Transactional theory of stress and coping (Lazarus and Folkman 1984):

The transactional theory was proposed by Lazarus and Folkman in 1984. This theory shows that stress and anxiety develop from the interaction between each individual and their surroundings. This framework concisely shows individual differences in stress responsibilities and provides a guide to understanding coping strategies [19, 20].

1.5.2 Job demands-resources (JD-R) Model:

The JD-R was proposed by Demerouti et al in 2001. This model shows two pathways that affect employees' outputs. Job demands (workload, time pressure, and technological stress) can cause eye strain in employees due to exposure to the blue light emitted by screens. It can cause exhaustion, irritation, annoyance, and in some cases, it can lead to overworked depression. While job resources (Autonomy, social support, training, experience, and feedback) are important, this model suggests that they can exacerbate the adverse effects of job demands on employees' mental and physical health. In aviation ground operations, this framework identifies which demands create stress and which resources protect employees' well-being (psychological and physical) and safety performance in a comfortable environment [21-23].

1.5.3 Techno-stress model:

In 2007, the techno-stress model was invented by Tarafdar et al. This model was based on the recognition of five technology-specific stressors. This includes overload, insecurity, complexity, and technological uncertainty. This model explains how we can provide comfort and a sense of safety (psychological peace and physical reassurance) to our employees so they can work without pressure and stress [11, 24].

This framework could be integrated to provide comprehensive knowledge about the JD-R model, which recognizes particular resources and demands. The transactional and technological stress model, which would help cope with pressure specific to the digital environment [25].

1.6 Hypotheses

Looking at the theory and literature review, we're proposing these hypotheses:

H_1: Higher levels of digital technology usage lead to increased techno stress among aviation ground staff.

H_2: Increased use of digital tools positively predicts general occupational stress for these employees.

H_3: Techno stress negatively affects the safety performance of ground employees.

H_4: Higher levels of general occupational stress are directly linked to decreased safety performance of ground crews].

H_5: Techno stress mediates the relationship between digital technology usage and safety performance.

H_6: Occupational stress mediates the relationship between digital technology usage and safety performance.

H_7: Digital technology usage has a direct negative effect on safety performance among aviation ground staff.

H_8: Job resources and management support moderate the negative relationship between techno stress and safety performance, such that the harmful effect is weaker when resources and support are high.

H_9: Strong organizational support and job resources moderate the negative relationship between occupational stress and safety performance, reducing its adverse impact.

1.7 Significance of the study:

This research holds theoretical, practical, and contextual significance for multiple stakeholders in aviation operations.

1.7.1 Theoretical significance: This study gives an overview of occupational stress and aviation safety literature by integrating three theoretical perspectives to explain technology-driven stress experiences. It investigates acknowledged research gaps about the experiences of ground employees.

1.7.2 Practical significance: This exploration would assist in assessment of the available evidence-based information to tackle digitalization dynamics in the aerospace industry. By gaining thorough insight into the interrelation between safety and stress, the authority designs its policies like training programs to assist targeted ground employees. The results can be utilized to design safety management systems that include the mental well-being of employees in conjunction with traditional safety issues.

1.7.3 Contextual significanc: The research may help in modernization of the aviation sector in Pakistan. The role of the Civil Aviation Authority of Pakistan is also constructive in shaping and preserving policies that strengthen aviation safety protocols on the one hand and ensure that employees' well-being is not compromised. This study will help shed light on the impact of digital transformation on the aviation sector of growing economies.

1.7.4 Stakeholder benefits: Ground employees gain efficient working environments and well-being support; organizations improve safety performance and operational efficiency; regulatory authorities develop employee-centered safety policies.

1.8 Scope and Limitations:

1.8.1 Scope: The study is confined to ground handling personnel working at airports of Pakistan, including ramp employees, customer services representatives, operations officers and users of GSE. Occupational stress and techno-stress dimension (technology-induced stress) are measured to assess the level of overall stress. The study explores the attributes of technology's role in the workplace, such as digitalization supporting operational management, communication, and tracking of safety practices through self-reported methodologies that investigate safety behavior or even perceived safety climate.

1.8.2 Limitations: Challenges must be recognized. First, pro-sectional designs; longitudinal research would bolster causal claims. Second, because we use self-reported measures, such data is prone to standard method-bias; however, procedural solutions will be employed. Third, the study focuses only on the Pakistani aviation scenario. Fourth, it is a study of ground employees as opposed to flight crew or managers. The heterogeneity in the outcomes of different organizational structures between airports and airlines makes it heterogeneous. Sixth, fast technological change implies that results are of present digital systems, which may change radically over time. Finally, it should be mentioned that it was an undergraduate thesis project with a very tight budget; thus, the sample size and geographical coverage could not be as extensive as more massive studies.

Literature Review

It is basically a literature review that summarizes other previous research on stress safety and all those work setups that are heavy on technology at ground level in aviation [4, 9, 14].

2.1 Underpinning Theory

Three different but somewhat related theories connecting technology stress and safety in aviation scenarios are the basis for this study but our primary grounded theory is JD-R model and secondary supported transactional theory of stress and coping and techno stress model [9, 17].

The main theory underlying occupational stress is the Transactional Theory of Stress and Coping developed by Lazarus and Folkman in 1984. Stress results from their interaction with the environment through cognitive appraisals, it says. Employees make judgments, first through primary appraisal, to determine whether a situation feels threatening or challenging or whatever. Then comes the secondary appraisal, in which they assess their options and resources for coping. It determines whether and how they respond to stress. In tech-heavy aviation jobs ground staff continue to weigh technology requirements against standard work pressures deciding whether it's too much [20, 29].

It is set within the framework of the Job Demands-Resources (JD-R) Model, which describes the effects of job characteristics on well-being and performance. It separates things into costly, straining demands such as workload, time pressure, role ambiguity, or tech stuff, and resources which facilitate getting work done, lessen demands, or permit growth, such as autonomy, social support, feedback, or organizational assistance. The crucial factors to motivate are the resources, whereas the demands are likely to cause burnout. Resources can also be adversely affected by the demand [1, 21, 22, 30].

Then there's the Techno-stress Model by Tarafdar and others, which focuses on stressors arising specifically from technology. It lists five creators techno-overload making you work faster longer techno-invasion blurring work and personal life techno-complexity when systems feel too hard to learn techno-insecurity fearing job loss to tech or better-skilled people and techno-uncertainty from constant changes keeping you unsettled. These reflect the particular pressures digital tools introduce into work [27, 31, 32].

2.2 Review of Key Concepts

2.2.1 Occupational Stress

Occupational stress arises when job demands mismatch workers' needs, causing harmful reactions (NIOSH). Stressors (workload, role conflicts, resource lacks) produce strains like anxiety and exhaustion [33].

In ground aviation, stress intensifies: tight schedules, irregular shifts, physical risks, unclear roles, and insufficient resources. Studies show >50% of ground crew experience medium-high stress, mainly from role issues and resource shortages[5, 34].

2.2.2 Techno-stress

Techno-stress affects those struggling to cope with ICT. It arises specifically from adopting, using, and learning technology. Five factors interact: overload, invasion, complexity, insecurity, and uncertainty [11, 27, 31, 32].

In aviation ground operations, digital tools (tracking, communication, scheduling, mobile apps) require juggling multiple interfaces under pressure. Techno-stress lowers productivity via complexity, uncertainty, and overload [34, 35].

2.2.3 Safety Behavior and Safety Performance

Safety behavior comprises two parts: compliance (protocols, PPE, risk control) and going above and beyond (helping coworkers, unpaid safety work, initiating activities) [22, 36].

Safety performance is measured using lagging indicators (literally, the outcome after an incident), such as injury rates, incident costs, or incident counts and leading indicators (proactive stuff) like training rates, inspections, near misses, reports, or suggestions. Good management uses both[36].

2.2.4 Digital Technology Adoption

Digital technology adoption means fully integrating digital tools into daily work. Success boosts productivity ~25%, but inexperience causes resistance [5]. Digitalization of aviation ground handling: real-time flight tracking, mobile app integration, and warehouse info for quick coordination [31].

Adoption poses health risks. Employees report disrupted work-life balance (constant connectivity blurs boundaries) and invaded privacy. Round-the-clock chaining to work affects how they experience the mass [34].

2.3 Variables Literature Leading to Hypothesis Development

2.3.1 Techno-stress and Job Performance

Being asked to process information, handle notification and respond to it on a short notice at any given time, continuous exposure to digital systems may lead to cognitive overload [15, 31, 32]. This evidence supports:

$H_{1:}$ Higher levels of digital technology usage lead to increased techno stress among aviation ground staff.

2.3.2 Digital Technology Usage and Occupational Stress

The use of ICT leads to occupational stress more than technology-related stress. The expectations on workload for employees is amplified by technology-mediated work as the workers are available to work beyond normal working hours.The overall work stress caused by the combination of work intensification with the help of technology is regarded as generic occupational stress [15, 20]. This evidence supports:

H_2: Increased use of digital tools positively predicts general occupational stress for these employees.

2.3.3 Technostress and Safety Performance

In studies, techno-stress is always associated with negative relationships with employee performance outcomes. The more sophisticated the technology, the more fear and frustration among employees, who need to struggle with the complex systems. The uncertainty of constant technological change is techno-uncertainty which is anti-focus and confidence. These issues are crucial when it comes to aviation settings where safety performance depends on constant monitoring, strict adherence to procedures and correct situational awareness. In the case of aviation ground personnel, a small failure in terms of equipment handling or communication can lead to time delay in delivery, airplane damage and/or safety events [9]. The following hypothesis is proposed:

H_3: Techno stress negatively affects the safety performance of ground employees.

2.3.4 Occupational Stress and Safety Performance

Stress not only diminishes the size of the attentional pie but also makes employees overlook critical safety signals. Fatigue induced by stress inhibits discretionary participation behaviors in safety. Aviation studies reveal that work-related stress has a negative influence on employee engagement and compliance. Safety performance consists of safety compliance (to do what one should do as per procedures) and safety participation (to perform voluntary safety activities).. Ground staff under stress are prone to cut corners on safety procedures when under time pressures [37]. This evidence supports:

H_4: Higher levels of general occupational stress are directly linked to decreased safety performance of ground crews].

2.3.5 Technostress as Mediator between Digital Technology Usage and Safety Performance

Techno-stress mechanisms partially mediate the relationship between digital technology usage and safety performance. Ground staff usage over complex digital systems lead to techno-overload excessive technology tasks, techno-complexity perception of skill inadequacies and techno-uncertainty constant change anxiety. These experiences of techno-stress then drain cognitive and emotional resources necessary for safe performance [8, 17, 21]. This evidence supports:

H_5: Techno stress mediates the relationship between digital technology usage and safety performance.

2.3.6 Occupational Stress as Mediator between Digital Technology Usage and Safety Performance

Digital technology use creates strain at work which mediates its impact on safety outcomes beyond merely strain from working with technology. These occupational stressors accumulate leading to psychological strain, fatigue, and burnout. Evidence from safety research shows that occupational strain is a direct predictor of violations and involvement in incidents. Ground workers who have high levels of occupational stress from technology-intensified demands demonstrate low safety motivation and attention to hazard controls [23, 38]. This evidence supports:

H_6: Occupational stress mediates the relationship between digital technology usage and safety performance.

2.3.7 Digital Technology Usage effect directly on Safety Performance

Techno-stress sequentially mediates digital technology use and occupational stress on safety performance. Transactional theory posits that technology-specific appraisals (primary appraisal of tech demands) precede broader occupational strain. Initially, employees face techno-stress: uncertainty about system changes, perceived complexity, and overload from technology tasks. These cumulative experiences deplete coping resources and produce negative affective states, contributing to general occupational stress. This occupational stress then degrades safety performance via attentional drain and reduced safety motivation. Such serial mediation reflects that technology influences safety not only through immediate interactions but also through cumulative strain processes affecting overall psychological well-being [9]. This evidence supports:

H_7: Digital technology usage has a direct negative effect on safety performance among aviation ground staff.

2.3.8 Job Resources and Support as Moderator between Techno-stress and Safety Performance

Job resources and support reduce techno-stress's harm to safety performance. The JD-R model says resources like freedom, help from others, training, and company support lessen job demands. Freedom allows adjusting work; social support gives emotional and practical aid; training builds confidence; company support fights isolation. A strong safety culture helps. Workers with resources stay safe under techno-stress; those without perform much worse [9]. This evidence supports:

H_8: Job resources and management support moderate the negative relationship between techno stress and safety performance, such that the harmful effect is weaker when resources and support are high.

2.3.9 Job Resources and Support as a Moderator between Occupational Stress and Safety Performance

Job resources and support buffer occupational and techno-stress on safety performance. The JD-R model lists autonomy, social support, training, and organizational support as mitigating adverse demands. Autonomy enables tech adaptation; social support provides help; training boosts self-efficacy, reducing threat; organizational support combats isolation. Safety culture reinforces priorities. Ground employees with resources maintain safety despite techno-stress; those without show dramatic performance drops [17]. This evidence supports:

H_9: Strong organizational support and job resources moderate the negative relationship between occupational stress and safety performance, reducing its adverse impact.

2.4 Theoretical Connections

These three theories tie together to explain the stress and safety in today's digital aviation workplaces.

The JD-R Model extends that by distinguishing job demands and resources. The appraisal process is initiated by factors like workload, time pressure, role ambiguity, and techno-stressors, while resources such as autonomy, social support, or training (and even the organizational support) help cope with it. The model has two branches: One leads to pressure, and the other to enthusiasm; the outcomes of both pathways are performance and well-being (either positive when proceeding along the path from motivation or negative when descending towards strain [20].

Transactional Theory helps further understand how people appraise stressors for ground staff facing tech demands or heavy workloads. They first figure out whether this is a threat (primary appraisal) and then look at the coping options available (secondary appraisal). Stress arises when demands exceed resources [17, 21, 22].

The Techno-stress Model considers the particular demands technology presents in modern jobs. People undergo transactional appraisal to determine whether techno-demands exceed their coping capacity. The composite framework highlights the overlap between layered stressors in digital aviation and their impact on safety and well-being [11, 31, 32].

2.5 Research Gap

Literature exists on aviation safety and general stress, but significant voids remain regarding techno-stress among ground employees [12].

Aviation research focuses on pilots and cabin crew; ground staff receive little attention despite critical work. Few studies link techno-stress directly to safety outcomes [39].

Techno-stress studies target office personnel, not safety-critical operations. Aviation safety literature overlooks individual tech stressors, favoring human factors. Digital transformation's effect on ground safety remains under-researched [15, 40, 41].

Pakistan-specific studies are rare; most evidence comes from Western contexts with different technologies, culture, and laws. Pakistan's growing aviation sector needs local research. Finally, moderators/mediators (safety culture, job resources, organizational support) in the stress-safety relationship are underexplored [21, 41].

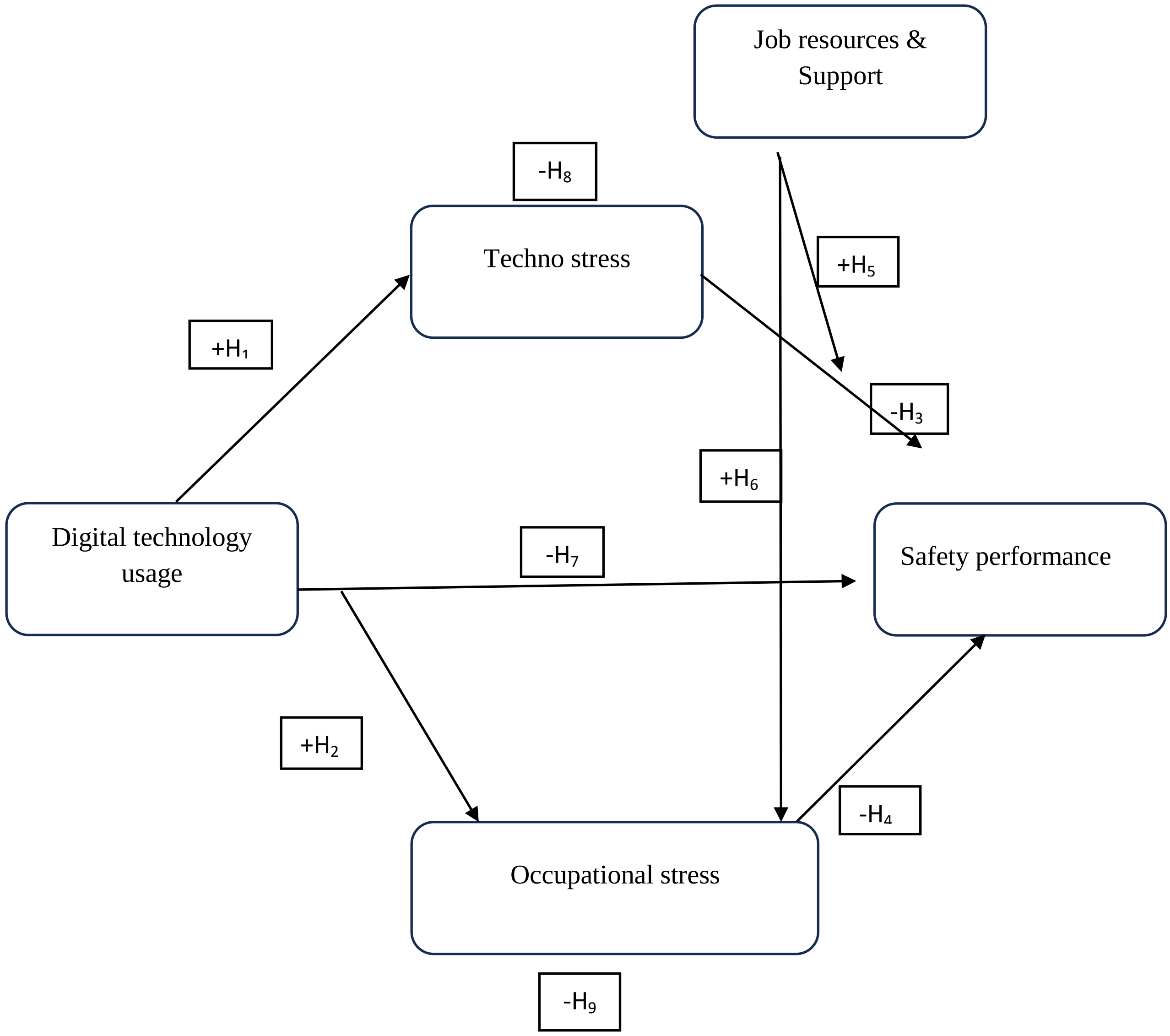
2.6 Research Model

This model integrates three theoretical perspectives to address identified gaps. The primary independent variable, digital technology usage, is hypothesised to increase techno-stress (H1) and general occupational stress (H2). Both stressors are expected to negatively affect safety performance (H3, H4). Beyond direct paths, techno-stress mediates the digital technology-safety performance relationship (H5), while occupational stress serves as a second mediator (H6). A direct negative effect of digital technology on safety performance is also proposed (H7). Sequentially, digital technology triggers techno-stress, which may spill over into general work stress, and this compounded pressure degrades safety performance. Finally, job resources and management support moderate both stress-safety relationships: when resources are high, the negative effects of techno-stress (H8) and occupational stress (H9) on safety performance are weakened. Thus, organisational support acts as a safety net, mitigating stress-induced risks to ground crew safety.

2.6.2 Quick reference guide

Variable	**Type**	**Definition**
Digital technology usage	Independent	Extent to which employees use digital tools (software, apps, systems) in daily
Techno stress	Mediator	Stress caused by technology (complexity, overload, uncertainty)
Occupational stress	Mediator	General work-related stress from job demands and pressure
Safety performance	Dependent	How well employees follow safety rules and SOPs
Job resources & Support	Moderator	Combined support system including Job Resources, Safety Culture, and Organizational Support

2.6.1 Table:



Methodology

Methodology exploring stress and safety among tech-driven ground workers outlines framework (design, population, sampling, philosophy, instruments, ethics, analysis, limitations). Quantitative approach examines techno-stress, safety behavior, occupational stress, organizational features in Pakistan's aviation [44].

3.1 Research Design

In terms of the correlation approach in this cross-sectional design, the study considers variable relations and frequency of events at one point in time [45].

The advantages of a cross-sectional design include: (1) relatively fast, cost-effective method for the purpose of an undergraduate thesis; (2) ability to collect data on many variables; and (3) ability to examine data in several airports simultaneously [46].

Collection of primary data involves structured surveys (both objective and closed/open questions) that measure perceptions, attitudes, and behavior. Structured standardized validated surveys provide quantitative data for analysis [47].

Limitations of cross-sectional designs: (1) it is just a snapshot of data, which makes it impossible to make causal or rank order conclusions; (2) correlations can be [48, 49].

3.2 Research Philosophy

Positivist philosophy serves as the foundation for this research, advocating for empirical observation and objective measurement. According to positivists, there is an objective reality of human experience that can be systematically analyzed to uncover the truth [50, 51]. Four major tenets of positivism include: (1) measurement in social/science inquiry, (2) obtaining information from empirically observed phenomena, (3) maintaining objectivity by distancing oneself from the context, and (4) establishing generalizable patterns [49].

Positivism is consistent with the hypothetico-deductive approach. A theoretical framework (e.g., Technostress, Job Demands-Resources Model, Transactional Stress Theory) forms a hypothesis. Instruments convert constructs (e.g., stress, social support, safety) into measures. The statistical analysis process either rejects or supports the hypotheses [50].

Positivism is consistent with the hypothetico-deductive approach. A theoretical framework (e.g., Technostress, Job Demands-Resources Model, Transactional Stress Theory) forms a hypothesis. Instruments convert constructs (e.g., stress, social support, safety) into measures. The statistical analysis process either rejects or supports the hypotheses [49, 50].

3.3 Population and Sampling

The target population consists of ground officials responsible for aviation at Pakistani airports. Ground staff operates in technology-based environments working with airplanes, passengers, machinery, ramps, operation coordination, and luggage handling within many airlines and companies [52]. Undergraduate research limitations made us use non-probability sampling method involving purposive and convenience sampling approaches [44, 53].

The convenience sampling technique allowed to choose readily accessible individuals in Pakistani airports (time/cost-effective sampling). Purposive sampling needed (a) ground aviation worker; (b) ≥ 6 months' work experience; (c) everyday use of digital technologies. Voluntary participation guarantees the validity of the result [54]. The sample size depended on statistical power requirements: the number of respondents should be > 200–230 (cases/predictors ratio = 10–15) [56, 57].

Non-probability sampling reduces generalizability and external validity. However, considering the exploratory nature of the research and undergraduate study [55].

3.4 Data Collection

Data Collection is done using a standard questionnaire, which is the main instrument used in survey research, to ensure uniformity in measurements, analyses, and question formulation for all subjects [44, 58].

3.5 Questionnaire Design

The questionnaire is developed according to set rules for developing survey instruments [58]. It is divided into several parts, each examining different constructs of the research model:

3.5.1 Section A: General Information

This section provides information on demographics and work history to be used for descriptive analysis and comparing stress levels and technology perceptions among different age groups and occupational categories. Gender choices: Male, Female, Other. Age categories: 18-30, 31-40, 41-50, above 50. Work history positions: Ramp Staff, Baggage Handler, Operations Coordination, or “Other”. Years in ground operations: less than 1 year, 1-3 years, 4-7 years, 8-11 years, or 12 years or more.

3.5.2 Section B: Digital Technology Usage

This chapter assesses the use of digital technologies by workers while working and measures their dependence on the use of digital technologies. The questions focus on how often digital technologies are used on a daily basis, whether workers are dependent on technology for connecting with other coworkers, and how much technology controls the work done by them, among others [9, 15].

3.5.3 Section C: Technology Stress

This section highlights specific stressors arising from technology use, based on the literature on “technostress”5. It aims to determine the harmful psychological price that digital devices have on employees. The questions are related, e.g., to the experience of being overwhelmed by the knowledge provided by digital systems or to being unable to adapt when a software is updated. We ask the respondents whether they are under pressure to complete their job faster due to technology, or if they are stressed due to some technological failures or downtime. The part also looks at the question of whether employees are under pressure to adapt to the changes in the workplace technology and gives a summary of the shifting outlines of these children of digital adaptation [31, 32].

3.5.4 Section D: Occupational Stress

This would not be just a matter of stress related to technology, but an assessment of occupational stress in general with regard to ground handling. It reflects the amount of work and emotional burden on employees. Work is amongst those vital points or areas from this viewpoint, which can include what to do when anxiety, stress, and fatigue regarding work activities creep in towards the end of the day. The survey question is whether the respondent believes that they have more work than they can comfortably accommodate, which is connected to the perceived manageability of workload. It also claims to take into consideration operational deadlines and pressures, like aircraft turnaround times, and whether or not employees are worrying that they are not fulfilling the demands of their job at all [1].

3.5.5 Section E: Job Resources & Support

In terms of organizational and social support within the framework of Job Demands-Resources theory, this section aims at assessing the negative consequences of their presence. In particular, these factors are considered the potential moderators that could offset the negative influence of stress on the health and productivity of workers. These items include whether adequate training on technology is provided to them during working hours and whether managers are supportive when they face problems while handling their tasks. The questionnaire also includes whether the company values worker well-being rather than productivity and whether employees feel competent enough to decide how to execute their tasks safely [36].

3.5.6 Section F: Safety Performance

The last section concentrates on the dependent variable – the measurement of safety behavior based on employee responses. It revolves around the extent to which the employees follow the safety guidelines and whether they can resist pressure and stress. In this context, this involves strictly following safety procedures while dealing with highly pressurized and time-critical situations and wearing appropriate personal protective equipment (PPE) at all times. Employees are also asked whether they ensure that the work environment is safe before embarking on the task and whether they report the safety issues without any delay. This section ends with an analysis of the role of stress in relation to compliance with safety, in both negative and positive ways. We remember whether the stress forces employees to comply with safety requirements [17].

3.6 Data Collection Procedure

The survey was administered using several methods to ensure that the highest possible number of people took part in the survey: hard copies available at the airports, web links, social media sites with attractive images, and QR codes for those who prefer their phones during transit [59].

All ethical considerations were adhered to. The survey was purely voluntary, and there were no penalties for non-participation or withdrawals from the research. Participants were properly informed about the study, their rights, and confidentiality issues. It took 4-6 weeks to collect data [60].

3.7 Data Analysis Techniques

We perform hypothesis testing through a quantitative method and/or statistics in order to answer our research problem. Here Structural Equation Modeling or software like Smart-PLS helps [60].

3.7.1 Preliminary Analysis

Data cleansing involved handling missing data, outliers, and distribution issues. Missing data was either removed or imputed where necessary [44, 58]. Descriptive statistics provide information about employee stress, technology usage, safety practices, and organizational support.

3.7.2 Reliability and Validity Assessment

Alpha test assesses reliability in measurement scale; items that score below 0.70 are considered unreliable. Validity tests check whether the tool is able to measure what it intends to. Content validity makes use of experts' opinion and previous findings, while construct validity employs factor analysis [60].

3.7.3 Inferential Analysis

The first step involves correlation analysis, often using Pearson's correlation coefficient, to determine the relationship between independent and dependent variables, including relationships such as techno stress vs. occupational stress vs. safety behavior, among other variables [60]. Multiple regression is applied when the researcher wants to test direct causality (e.g., stress -> safety behavior). The moderation analysis investigates whether safety culture or safety resources moderate the stress-outcome relationships using interaction analysis.

3.8 Ethical Considerations

The research follows traditional ethical practices in relation to research on humans. We obtain official ethical approval prior to initiating the research process [50].

All participants were thoroughly informed about the purpose of the research, methods to be employed, anticipated duration, possible benefits and risks, and that their participation is completely voluntary. Participants may withdraw at any point without suffering any repercussions. The consent form is acquired through traditional or electronic means [61].

3.8.1 Confidentiality and Anonymity: All data collected is non-identifiable, which means that we cannot identify individuals, thereby maintaining anonymity. It is exclusive for the research team to be utilized with data because digital security, in fact, also plays a great role in the secure storage of data [60].

3.8.2 Data Protection: All information is used strictly for this academic study. It is kept securely only as long as needed, and then securely deleted. Some publications only reported summary results [59].

Again, it's totally voluntary.” Participants are free to skip questions or discontinue at any moment without penalties.

3.9 Methodological Limitations

Like most studies, this study has some limitations that should be taken into account when interpreting the results [49].

Cross-Sectional design, in this design, we measure only at one time point, which allows us to say that there is an association between two variables but not causation. “Whether this stress results in safety of a worse nature, or vice versa, we don’t have too much data on. This would require a longitudinal design [48].

If that's the case, non-probability sampling, convenience, or purposive types mean that because the sample isn’t perfectly reflected, it’s not a generalization to all ground employees in Pakistan or beyond. There may also be selection bias if responders differ from non-responders in significant ways [49].

Data Analysis

This chapter analyzes data from 220 Pakistani aviation ground employees using Smart-PLS. It covers demographic profiling, reliability/validity testing, and PLS-SEM for hypothesis testing.

4.1 Demographic Analysis

The research sampled 220 aviation ground employees in the different airports in Pakistan. Demographic analysis indicates that it is as follows distributed:

4.1.1 Table: Demographic Characteristics of Respondents (N=220)

Demographic Variable	Category	Frequency (n)	Percentage %
Gender	Male	139	63.2%
	Female	81	36.8%
	Other	0	0%
Age group	18 – 30 years	137	62.3%
	31 – 40 years	53	24%
	41 – 50 years	25	11.4%
	Above 50 years	5	2.3%
Job role	Customer service	77	35%
	Operations coordinator	64	29%
	Ramp staff	34	15.5%
	Baggage handler	14	6.4%
	Other	31	14%
Experience	Less than 1 year	52	23.6%
	1 – 3 years	56	25.4%
	4 – 7 years	51	23.1%
	8 – 11 years	37	16.8%
	12 or more than 12 years	24	10.9%

Majority male (63.2%), 62.3% aged 18–30. Largest roles: customer service (35%), operations coordination (29%). Experience balanced.

4.2 Reliability Analysis:

Cronbach's alpha was computed to assess the internal consistency of all measurement scales. Values above 0.70 indicate acceptable reliability.

Constructs	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Digital technology usage	0.834	0.854	0.882	0.600
Job resources & Support	0.847	-2.139	0.000	0.088
Occupational stress	0.859	0.863	0.899	0.639
Safety performance	0.859	0.866	0.898	0.638
Techno stress	0.878	0.886	0.911	0.671

All constructs show satisfactory internal consistency (α = 0.834–0.878). Four constructs have high composite reliability (rho_c = 0.882–0.911) and AVE > 0.50 (0.600–0.671). However, "Job resources & Support" has problematic rho_c = 0.000 (rho_a = –2.139) and AVE = 0.088, indicating serious convergent validity issues.

4.3 Discriminant Validity:

Discriminant validity was measured using the Heterotrait-Monotrait (HTMT) ratio. All the values of HTMT are less than the conservative value of 0.85 which proves that each construct is empirically different in the model.

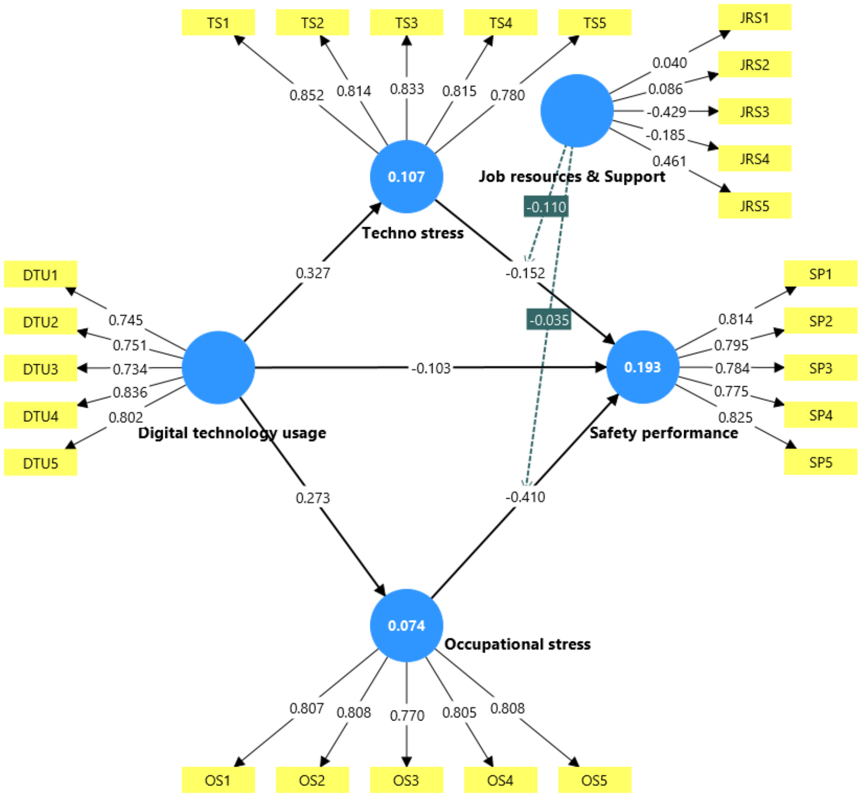
Constructs	**Digital technology usage**	**Job resources & Support**	**Occupational stress**	**Safety performance**	**Techno stress**	**Job resources & Support x Techno stress**
Digital technology usage						
Job resources & Support	0.180					
Occupational stress	0.316	0.125				
Safety performance	0.123	0.082	0.468			
Techno stress	0.368	0.109	0.115	0.168		
Job resources & Support x Techno stress	0.035	0.039	0.079	0.119	0.198	
Job resources & Support x Occupational stress	0.051	0.054	0.042	0.049	0.083	0.064

4.4 Structural Equation Modeling (SEM) Analysis:

HYP	**Construct Path**	**β**	**P values**	**Result**
H_1	DTU → TS	0.327	0.000	Supported
H_2	DTU → OS	0.273	0.000	Supported
H_3	TS → SP	-0.127	0.080	Unsupported
H_4	OS → SP	-0.406	0.000	Supported
H_5	DTU → TS → SP	-0.0415 (indirect)	0.099	Unsupported
H_6	DTU → OS → SP.	-0.1108 (indirect)	0.001	Supported
H_7	DTU → SP	-0.103	0.400	Unsupported
H_8	TS × JRS → SP	-0.055	0.502	Unsupported
H_9	OS × JRS → SP	-0.021	0.733	Unsupported

β = standardized path coefficient; significance at $p < 0.05$

Diagram 4.4.1



4.4.1 Direct Effects

Digital technology usage significantly predicts both techno-stress (β = 0.327, p < 0.001) and occupational stress (β = 0.273, p < 0.001), supporting H1 and H2. Techno-stress does not significantly affect safety performance (β = -0.127, p = 0.080), so H3 is not supported. Occupational stress shows a significant negative effect on safety performance (β = -0.406, p < 0.001), supporting H4.

4.4.2 Mediation Effects

Constructs Paths	β	P values	Results
Digital technology usage -> Occupational stress -> Safety performance	0.111	0.000	Supported
Digital technology usage -> Techno stress -> Safety performance	0.042	0.126	Unsupported

H5 (DTU → TS → SP) not supported: techno-stress → SP non-significant (β = –0.127, p = 0.080). H6 (DTU → OS → SP) supported: DTU → OS significant, OS → SP significant, direct DTU → SP non-significant (β = 0.054, p = 0.400), indicating full mediation by occupational stress. H7 (direct DTU → SP) non-significant (β = 0.054, p = 0.400), not supported.

4.4.3 Moderation Effects

H8 proposed that job resources and support (JRS) moderates the relationship between techno-stress and safety performance. However, the interaction term (JRS × Techno-stress → Safety performance) is not significant (β = -0.055, p = 0.502). Therefore, H8 is not supported. H9 proposed that job resources and support moderates the relationship between occupational stress and safety performance. The interaction term (JRS × Occupational stress → Safety performance) is also not significant (β = -0.021, p = 0.733). Therefore, H9 is not supported.

4.5 Model Fit and predictive power

The model explains 10.7% of the variance in techno-stress, 7.4% in occupational stress, and 19.3% in safety performance. The predictive validity (R^2) of safety performance is low to moderate.

Constructs	R^2	R^2 adjusted
Occupational stress	0.074	0.070
Safety performance	0.193	0.170
Techno stress	0.107	0.103

4.5.1 Model Fit Indices

	Saturated model	Estimated model
SRMR	0.116	0.117
d_ULS	4.409	4.416
d_G	0.725	0.725
Chi-square	885.960	884.147
NFI	0.658	0.658

Values of SRMR (saturated: 0.116; estimated: 0.117) go beyond 0.08, suggesting a poor fit. NFI = 0.658 (less than 0.90) shows poor incremental fit.

Discussion

5.1 Introduction

This chapter interprets findings, answers RQs, compares with literature, and states implications.

5.2 Discussion of Findings

5.2.1 Digital Technology Usage and Stress (RQ1, RQ3)

Digital technology use has a strong relationship with techno-stress (β = 0.327) and job stress (β = 0.273) for Pakistani ground crew members of airlines (RQ1, RQ3), which corresponds with the Techno-stress Model by Tarafdar et al. Earlier studies have established that individuals who perform more than 250 digital activities a day experience cognitive overload. Ground crew members who utilize real-time tracking and mobile applications face greater stress levels when their coping abilities fail to meet the demands of the situation (Transactional Theory). The observation that 62.3% are between 18 and 30 years old is pertinent in techno-uncertainty [11, 24].

5.2.2 Stress and Safety Performance (RQ2)

A negative significant correlation between occupational stress and safety performance was found (β = -0.406, p < 0.001), suggesting that the more stress employees experience, the worse their safety behavior on the ground will be (RQ2; support H2, JD-R Model). The effect of traditional stressors such as workload, work speed pressure, rotating shifts, and role ambiguity is detrimental to safety, which aligns with previous studies showing decreased concentration and conformity (IATA: more than $5 billion per year in ground damage). However, techno-stress failed to significantly predict safety performance (β = -0.127, p = 0.080; no support for H3). Traditional stressors are more important than techno-specific stressors in Pakistan, probably because techno-stress effects can only act via occupational stress or adaptation occurs [17].

5.2.3 Mediating Mechanisms (H_5-H_7)

In the mediation analysis, occupational stress, not techno-stress, emerged as the main mediator in the relationship between the use of digital technology and safety performance. H6 was fully supported as DTU positively predicts OS (β = 0.273, p < 0.001), OS negatively predicts SP (β = –0.406, p < 0.001), but there was no significant direct impact of DTU on SP (β = 0.054, p = 0.400). Hence, digital technology affects safety performance exclusively through increased general occupational stress. H5 and H7 failed (techno-stress→SP, p = 0.080; direct effect β = –0.103, p = 0.400). From a theoretical perspective, cumulative strain in the form of occupational stress, which stems from various sources including digital technology, becomes relevant to safety. From a practical point of view, general occupational stress must be addressed rather than specific technology-related stress at this stage of digitalization in Pakistan .[15].

5.2.4 Buffering Role of Job Resources and Support (RQ4)

Despite expectations from theory, job resources and support did not mediate the relationship between stress and safety. In both cases, the interaction effects were nonsignificant (techno-stress × JRS → SP: β = –0.055, p = 0.502; occupational stress × JRS → SP: β = –0.021, p = 0.733), leading us to reject hypotheses H8 and H9, which contradicted the buffer assumption of the JD-R model. There exist several reasons for this outcome: (1) critical measurement problems (rho_c = 0.000, AVE = 0.088) showing that the instrument used is invalid in the aviation industry of Pakistan; (2) poor model fit (SRMR = 0.116–0.117, NFI = 0.658); (3) no buffering because of the demanding nature of ground operations, where time pressure and consequences of errors overcome any support offered by supervisors; and (4) inability of crosssectional research design to capture the buffering effects [17]. Despite this nonsignificance of moderations, occupational stress still showed significant negative effect on safety performance (β = –0.406), supporting the RQ4.

5.3 Comparison with Prior Studies

The results confirm yet contrast with previous literature on the subject. In line with other research showing that 50.75% of ground crews involved in aviation suffer from medium-high stress levels, the current study shows occupational stress to be a problem for Pakistani ground workers. Higher use of digital technologies is a positive predictor for both occupational stress (β = 0.273, p < 0.001) and techno-stress (β = 0.327, p < 0.001) [17].

There is a contradiction to this result with respect to the link between techno-stress and safety performance compared to previous aviation research. Previous studies have shown that the components of techno-stress were negatively correlated with crew performance; however, in this study, there was no significant influence of technostress on safety performance (β = –0.127, p = 0.080). On the other hand, occupational stress had a very strong impact on safety performance (β = –0.406, p < 0.001), consistent with previous human factors research [22, 36].

The mediating effect of occupational stress between the use of digital technology and safety performance was wholly validated, in line with previous research. Mediation through techno-stress, however, did not validate, contradicting some earlier models. Unlike in the JD-R model, job resource support did not significantly moderate both paths. This inconsistency might be due to problems with measurement tools, specifically poor convergent validity of job resources constructs (AVE = 0.088), or perhaps contextual differences in the Pakistani aviation industry environment [17].

This research identifies the lack of evidence regarding stress-safety relationship from a developing nation as a major research gap that needs attention. Although most studies done in the field of aviation have emerged from a western background, this study highlights the importance of the stress-safety relationship in a rapidly modernizing South Asian aviation industry. The poor predictive accuracy (R^2 = 19.3%) along with substandard model fitness (SRMR > 0.08, NFI < 0.90) shows that there are other factors involved in stress safety relationship.

5.4 Practical Implications

Such evidence allows for evidence-based actions. Organizations should: (1) decrease techno-complexity and uncertainty via training; (2) create user-oriented designs with minimized cognitive load; (3) create stress management programs to deal with technological and non-technological stressors; (4) increase support from supervisors and peers; (5) develop safety culture focusing on safety above productivity; (6) incorporate measures of well-being into their Safety Management System.

Such evidence is important for understanding the Civil Aviation Authority policy implemented in Pakistan which requires airlines and ground staff to be provided with stress management resources. Ground staff, thus, will benefit from their improved working environment and safety.

5.5 Theoretical Implication:

This research contributes to the body of knowledge on techno-stress and safety by bringing together the JD-R framework and the stressor-strain-outcome approach in the aviation sector. This study presents techno-stress as a job demand that influences safety behavior via strain among employees. Contrary to theories that are neutral about technology, findings from this study indicate that digital stressors can predict safety compliance and infractions. Additionally, collegial support is identified as a moderator variable in this study, providing theoretical specificity to collectivist societies.

5.6 Limitations and Future Research

Some of the limitations of this research include cross-sectional design (no cause and effect relations can be established), subjective measures (possibility of bias), geographical limitation of the research to Pakistani airports, sampling without probability sampling, construct narrowness, and limitations associated with being an undergraduate researcher (e.g., sample size). Further research could focus on longitudinal/cross-cultural designs, use objective/multi-source measures, study separate constructs of techno-stress, study more mediators/moderators such as job burnout or leadership, interventions, other critical safety industries such ashealthcare or manufacturing, and employ qualitative methods.

5.7 Summary of main findings

The significant positive impacts of technology use intensity on techno-stress ($\beta = 0.327$, $p < 0.001$) and occupational stress ($\beta = 0.273$, $p <0.001$) have validated H1 and H2, respectively. The effects of the two types of stress on safety performance have revealed a negative effect for occupational stress ($\beta = –0.406$, $p < 0.001$, validating H4), but not techno-stress ($\beta = –0.127$, $p = 0.080$, H3 not supported). Occupation stress was confirmed to be a full mediator between technology use and safety performance (indirect effect: $\beta = –0.111$, $p = 0.001$, validating H6). On the other hand, techno-stress mediation (H5) and direct effect (H7) were not confirmed. Surprisingly, job resources did not moderate the impact of the two types of stress on safety performance (H8: $\beta = –0.055$, $p = 0.502$; H9: $\beta = –0.021$, $p = 0.733$). These findings are highly questionable since the constructs used lack construct validity (AVE = 0.088, rho_c = 0.000). The model accounted for 10.7% (techno-stress), 7.4% (occupational stress).

5.8 Theoretical Contributions

The current study contributes theoretically in several ways. Firstly, it brings together Transactional theory, JD-R model, and Techno-stress model to examine technologyinduced stress on occupational safety issues. Secondly, it expands the scope of aviation literature to examine understudied ground handling workers and the stress that affects them. Thirdly, it identifies a serial mediation process, where technostress builds up through occupational stress to impact occupational safety. Fourthly, it adds context by examining moderating role of contextual variables like resource availability and culture in a non-Western country like Pakistan. Fifthly, it confirms the JD-R buffer hypothesis, as job resources reduce stress effects.

5.9 Practical Contributions

The present study makes a number of contributions. Airlines need to decrease technocomplexity and techno-uncertainty by means of continuous training, design that considers users' needs, and stress management programs. Safety management systems should incorporate well-being parameters, conduct regular stress tests, and place safety above productivity when time pressure is involved. The human resources function will benefit from training on supportive leadership, peer assistance, job autonomy, and performance management which attributes safety violations to inadequate resources rather than individual weaknesses. Regulators will have to require stress testing and support structures, and technology training as part of safety audits. Ground crew personnel should receive appropriate training and be supported in an environment focused on their well-being.

5.10 Conclusion

In conclusion, it is established that the application of digital technologies leads to the enhancement of techno-stress and occupational stress levels among Pakistani aviation ground personnel. It was discovered that only occupational stress influences safety performance negatively (by lowering attention, decision-making, and compliance), whereas techno-stress does not affect safety significantly directly. Moreover, occupational stress partially mediates the connection between technology and safety performance, which means that the negative impact of digital technologies on safety results from occupational stress. In contrast to predictions based on the JD-R model, job resources failed to act as moderators of stress-related effects on safety performance, but these findings cannot be considered reliable due to low construct validity (AVE = 0.088). The proposed model accounted for 19.3% of the variability in safety performance, demonstrating suboptimal fit and missing some influential variables (e.g., safety culture and coping).

References

1. Kaur, I. and J. Kaur, *Occupational Stress Among Ground Crew: An Empirical Study of Aviation Industry in Northern India.*
2. Jermier, J.M., J. Gaines, and N.J. McIntosh, *Reactions to physically dangerous work: A conceptual and empirical analysis.* Journal of Organizational Behavior, 1989. 10(1): p. 15-33.
3. Debbage, K.G. and D. Delk, *The geography of air passenger volume and local employment patterns by US metropolitan core area: 1973–1996.* Journal of Air Transport Management, 2001. 7(3): p. 159-167.
4. Alam, M.A., *Techno-stress and productivity: Survey evidence from the aviation industry.* Journal of Air Transport Management, 2016. 50: p. 62-70.
5. Firlej, M., *The Impact of Human Factors on the Safety of Airport Ground Operations.* Safety & Defense, 2025. 11(1): p. 63-72.
6. Kıyıklık, A., A.O. Kuşakcı, and B. Mbowe, *A digital transformation maturity model for the airline industry with a self-assessment tool.* Decision Analytics Journal, 2022. 3: p. 100055.
7. Pestana, G., et al. *Safe management of fleet operations in complex and critical infrastructures*. in *12th World Conference on Transport Research (WCTR10), Portugal*. 2010.
8. Kim, Y. and W. Cho, *A study on digital transformation in the aviation industry: Trends and application.* Global Business & Finance Review, 2025. 30(6): p. 1.
9. Jyoti, J., M. Ahmad, and M. Mahajan, *From Techno-stressors to Techno-Exhaustion: The Mediating Role of Techno-Anxiety in IT Workplace.* International Journal of Applied Management and Technology, 2025. 25(1): p. 2.
10. Borle, P., et al., *How are techno-stressors associated with mental health and work outcomes? A systematic review of occupational exposure to information and communication technologies within the technostress model.* International Journal of Environmental Research and Public Health, 2021. 18(16): p. 8673.
11. Bondanini, G., et al., *Technostress dark side of technology in the workplace: A scientometric analysis.* International journal of environmental research and public health, 2020. 17(21): p. 8013.
12. Kumari, P. and P. Aithal, *Stress inducing factors and relevant strategies deployed to overcome stress in the aviation industry sector–A systematic literature review and further research agendas.* International Journal of Management, Technology, and Social Sciences (IJMTS), 2020. 5(2): p. 347-371.
13. Muecklich, N., et al., *The role of human factors in aviation ground operation-related accidents/incidents: A human error analysis approach.* Transportation Engineering, 2023. 13: p. 100184.
14. Cahill, J., P. Cullen, and K. Gaynor, *The case for change: aviation worker wellbeing during the COVID 19 pandemic, and the need for an integrated health and safety culture.* Cognition, Technology & Work, 2023. 25(1): p. 75-117.
15. Cavicchioli, M., et al., *Employees' attitudes and work-related stress in the digital workplace: An empirical investigation.* Frontiers in Psychology, 2025. 16: p. 1546832.

16. Uchroński, P., *Analysis of the Operation of the Ground Handling Agent in the Aspect of Safety*. Journal of KONBiN, 2020. 50.
17. Bakker, A.B. and E. Demerouti, *The job demands-resources model: State of the art.* Journal of managerial psychology, 2007. 22(3): p. 309-328.
18. Goh, Y.W., S. Sawang, and T.P. Oei, *The Revised Transactional Model (RTM) of occupational stress and coping: An improved process approach.* The Australasian Journal of Organisational Psychology, 2010. 3: p. 13-20.
19. Laubmeier, K.K., S.G. Zakowski, and J.P. Bair, *The role of spirituality in the psychological adjustment to cancer: A test of the transactional model of stress and coping.* International journal of behavioral medicine, 2004. 11(1): p. 48-55.
20. Obbarius, N., et al., *A modified version of the transactional stress concept according to Lazarus and Folkman was confirmed in a psychosomatic inpatient sample.* Frontiers in psychology, 2021. 12: p. 584333.
21. Veldhuis, W., et al., *Stimulating adaptive performance of pilots using the job demands-resources model*. 2016, Master Thesis). Retrieved from WorldCat database, OCLC.
22. Mazzetti, G., et al., *Work engagement: A meta-analysis using the job demands-resources model.* Psychological reports, 2023. 126(3): p. 1069-1107.
23. Lee, D.Y. and Y. Jo, *The job demands-resource model and performance: the mediating role of employee engagement.* Frontiers in Psychology, 2023. 14: p. 1194018.
24. Benzari, A., A. Khedhaouria, and O. Torrès, *The rise of technostress: A literature review from 1984 until 2018.* 2020.
25. Howe, E., et al. *Design of digital workplace stress-reduction intervention systems: Effects of intervention type and timing*. in *Proceedings of the 2022 CHI conference on human factors in computing systems*. 2022.
26. Ayaz, Q., M. Abubakari, and J. Hussain, *A policy and institutional analysis of urban transport system: The case of Pakistan's lahore in the context of COVID-19.* Cogent Social Sciences, 2024. 10(1): p. 2406638.
27. Jain, S., et al., *Technostress at workplace: Antecedents, decisions and outcomes (ADO) and future research pathways through a systematic literature review.* Asian Journal of Business Research, 2024. 14(3).
28. Asghar, S. and H. Mohsin, *Pakistan air lines (PIA)–A case study.* ISSRA Papers, 2023. 15(1): p. 111-125.
29. Templeman, M.E., et al., *Student responses to advance directives assignments in undergraduate courses in the United States: A qualitative examination of stress appraisals, coping, and outcomes.* Death Studies, 2022. 46(9): p. 2215-2225.
30. Chen, C.-F. and S.-C. Chen, *Investigating the effects of job demands and job resources on cabin crew safety behaviors.* Tourism Management, 2014. 41: p. 45-52.
31. Srivastava, S.C., *DO TECHNOSTRESS CREATORS INFLUENCE EMPLOYEE INNOVATION?*
32. Fischer, T., A. Pehböck, and R. Riedl, *Is the technostress creators inventory still an up-to-date measurement instrument? Results of a large-scale interview study.* 2019.
33. Girma, B., et al., *Occupational stress and associated factors among health care professionals in Ethiopia: a systematic review and meta-analysis.* BMC Public Health, 2021. 21(1): p. 539.
34. Marsh, E., E.P. Vallejos, and A. Spence, *The digital workplace and its dark side: An integrative review.* Computers in Human Behavior, 2022. 128: p. 107118.
35. Yıldırım, B., et al., *Bibliometric analysis with R biblioshiny on safety behavior in aviation.* International Journal of Aviation, Aeronautics, and Aerospace, 2025. 12(1): p. 4.

36. Chen, C.-F. and S.-C. Chen. *Upward safety communication and safety behavior of cabin crew*. in *Proceedings of the Eastern Asia society for transportation studies*. 2013.
37. Samuels, T., *How to construct a safety management system (SMS) that promotes safety culture in your organization.* International Journal of Aviation, Aeronautics, and Aerospace, 2022. 9(2): p. 3.
38. Harunavamwe, M., C. Ward, and T. Marange, *Influence of technostress on work engagement and workplace flourishing: the mediating role of perceived organizational support.* Cogent Psychology, 2025. 12(1): p. 2561437.
39. Studic, M., et al., *A systemic modelling of ground handling services using the functional resonance analysis method.* Transportation Research Part C: Emerging Technologies, 2017. 74: p. 245-260.
40. Waddington, E. and P. Ansell, *A definition, conceptual framework, and pathway towards sustainable aviation.* Progress in Aerospace Sciences, 2024. 151: p. 101050.
41. Minoretti, P., et al., *Occupational health challenges for aviation workers amid the changing climate: a narrative review.* Cureus, 2024. 16(3).
42. Assessment, R., *Conceptual Framework*. 2013, Routledge. Aven.
43. Braun, C.P., *Exploring a New Conceptual Framework in Aviation Maintenance Incident Reporting Using Natural Language Processing.* 2024.
44. Ponto, J., *Understanding and evaluating survey research.* Journal of the advanced practitioner in oncology, 2015. 6(2): p. 168.
45. Sreekumar, D., *What is research methodology? Definition, types, and examples.* Paperpal Blog-Academic Writing Guides, 2023.
46. Groves, R.M., et al., *Survey methodology*. 2011: John Wiley & Sons.
47. Olsen, C. and D.M. St George, *Cross-sectional study design and data analysis.* College entrance examination board, 2004. 26(03): p. 2006.
48. Simkus, J., *Cross-sectional study: Definition, designs & examples.* Simply Psychology, 2023.
49. Setia, M.S., *Methodology series module 3: Cross-sectional studies.* Indian journal of dermatology, 2016. 61(3): p. 261-264.
50. Park, Y.S., L. Konge, and A.R. Artino Jr, *The positivism paradigm of research.* Academic medicine, 2020. 95(5): p. 690-694.
51. Dulal, T.D., *Application of positivism and post positivism approach in contemporary research.* International Journal of Applied Research and Sustainable Sciences, 2025. 3(4): p. 305-314.
52. Dobrowolska, M., M. Stasiła-Sieradzka, and J. Kozuba, *Safety attitude as a predictor of the sense of threat in the workplace, using the example of airport ground staff.* Sustainability, 2020. 12(16): p. 6569.
53. Valko, A. and N. Suvorova, *Research of the role of handling companies in providing services at the airport.* ВЧЕНІ ЗАПИСКИ, 2021: p. 22021153.
54. Etikan, I., S.A. Musa, and R.S. Alkassim, *Comparison of convenience sampling and purposive sampling.* American journal of theoretical and applied statistics, 2016. 5(1): p. 1-4.
55. Andrade, C., *The inconvenient truth about convenience and purposive samples.* Indian journal of psychological medicine, 2021. 43(1): p. 86-88.
56. Ullman, J.B. and P.M. Bentler, *Structural equation modeling.* Handbook of psychology, second edition, 2012. 2.
57. Lv, M., H. Liu, and Z. Liu. *Research on the design of smart home products for the elderly based on SEM*. in *International Conference on Automation Control, Algorithm, and Intelligent Bionics (ACAIB 2024)*. 2024. SPIE.

58. Abawi, K., *Data collection methods questionnaire & interview*. Training in Sexual and Reproductive Health Research, 2017.
59. OGUNSANWO, S. and I. Bello, *Principles of Informed Consent and Confidentiality*. Available at SSRN 4857301, 2024.
60. Vadakedath, S. and V. Kandi, *Clinical research: A review of study designs, hypotheses, errors, sampling types, ethics, and informed consent.* Cureus, 2023. 15(1).
61. Crossan, F., *Research philosophy: towards an understanding.* Nurse Researcher (through 2013), 2003. 11(1): p. 46.