IJCEAS

International Journal of Contemporary Economics and Administrative Sciences
ISSN: 1925 – 4423
Volume: XVI, Issue: 1, Year: 2026, pp. 1523-1546

The Mediating Role of Work Engagement in the Relationship Between Technostress and Innovative Work Behaviour Among Airline Employees

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Received: 02.06.2026, Accepted: 28.06.2026
DOI Number: 10.5281/zenodo.21002609

Abstract

In digitalized sectors, information and communication technologies create organizational stress known as technostress. Examining its impact on employees' innovative work behaviour is important in aviation, where digital systems are widely used. The psychological mechanisms of this relationship remain insufficiently explained. Work engagement, defined as employees' energy, dedication, and absorption, is a key motivational resource and potential mediator. This study examines the effect of technostress on innovative work behaviour among airline employees and the mediating role of work engagement. A quantitative cross-sectional correlational survey design was used. The sample consists of 412 employees in airline companies operating in Türkiye. Data were collected via an online questionnaire using convenience sampling. The Technostress at Work Scale, Utrecht Work Engagement Scale (UWES-9), and Innovative Work Behaviour Scale were used. Data were analysed using SPSS 22.0 and PROCESS Macro v4.2. Results indicate technostress negatively affects innovative work behaviour while work engagement partially mediates this relationship

Keywords: Technostress, Work Engagement, Innovative Work Behaviour, Airline Employees, Digitalization.

JEL Code: M12, M54, O33

1. Introduction

Rapid developments in digital technologies have fundamentally transformed the ways organizations conduct business and have significantly increased employees' dependence on information and communication technologies in their daily work processes. While enterprise software, mobile applications,

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automation systems, and continuously updated digital platforms enhance speed and efficiency in work processes, they also create new psychological demands and pressures on employees. In this context, technostress—one of the concepts receiving increasing attention in the literature—refers to the stress reactions experienced by individuals during the process of using or adapting to technology (Tarafdar, Cooper, & Stich, 2019).

Technostress arises not only from the presence of technological tools but also from factors such as their intensive use, expectations of constant availability, rapid technological changes, and increasing cognitive load. Research indicates that technostress generally produces negative effects on employees' job satisfaction, well-being, and organizational attitudes (Kot, 2022; Curcuruto et al., 2023). Particularly in highly digitalized sectors, employees may face risks such as burnout, work withdrawal, and performance decline due to increasing job demands and complex systems. Nevertheless, recent studies suggest that the effects of technostress on employee behaviour are not unidirectional or entirely negative. Some research argues that, under certain conditions, technostress may encourage employees to exert greater effort, engage in learning, and generate innovative solutions (Tarafdar et al., 2019; Zhang et al., 2025). This perspective indicates that technostress may produce different outcomes depending on whether it is perceived by individuals as a hindrance/threat or as a challenge and development opportunity.

In the digitalization era, innovative work behaviour plays a critical role in helping organizations achieve sustainable competitive advantage. Innovative work behaviour encompasses employees' processes of generating new ideas, promoting these ideas, and implementing them (Janssen, 2000). However, the emergence of such behaviours depends not only on technical skills but also on employees' psychological resources and work-related attitudes. The literature emphasizes that high levels of stress may suppress innovative behaviours by leading employees to avoid risk-taking and rely on existing routines (Zhang, 2023).

At this point, work engagement emerges as an important psychological mechanism in explaining the relationship between technostress and innovative work behaviour. Work engagement is defined as a positive, work-related state characterized by employees' feelings of energy, dedication, and absorption in their work (Schaufeli et al., 2002). Previous research indicates that technostress may weaken work engagement and thereby indirectly hinder employee performance and innovative behaviours (Kot, 2022; Harunavamwe & Kanengoni, 2023). Conversely, high levels of work engagement may enable employees to maintain innovative behaviours even under stressful conditions.

The airline industry, where digital technologies are used intensively, provides a unique and important context for examining the effects of technostress on employee behaviour. Airline employees must work with operational software, flight planning systems, safety and quality applications, and continuously updated digital infrastructures, which expose them to high levels of technological demands. Despite this, empirical studies that examine the relationships among technostress, work engagement, and innovative work behaviour within a comprehensive model

in the airline context remain limited. This study aims to fill this gap by testing the mediating role of work engagement in the relationship between technostress and innovative work behaviour among airline employees.

Accordingly, the purpose of this study is to examine the effect of technostress on innovative work behaviour among airline employees and to reveal the role of work engagement in this relationship. The study seeks to explain how technostress influences employees' innovative behaviours in highly digitalized work environments and through which psychological mechanisms this effect is shaped via work engagement. In this respect, the research aims to provide a mechanism-based contribution to understanding the effects of digitalization on employee behaviour.

2.Theoretical Background and Hypothesis Development

2.1. Technostress: Conceptual Framework and Dimensions

The intensive integration of information and communication technologies into work processes has increased employees' job demands and led to the emergence of new sources of stress. In this context, technostress is defined as the psychological strain experienced by individuals in the process of using technology, adapting to technology, or coping with technological changes (Salanova, Llorens, & Cifre, 2013; Tarafdar, Cooper, & Stich, 2019). In the literature, technostress is conceptualized as a consequence of the cognitive, emotional, and behavioural burdens imposed on employees alongside the benefits provided by technology.

The phenomenon of technostress is most explained within the framework of the Job Demands–Resources (JD-R) model. According to this model, technology-based demands create additional workload and mental pressure for employees; in the absence of sufficient individual or organizational resources, burnout and negative work attitudes are likely to emerge. Empirical studies consistently demonstrate that technostress generally exerts negative effects on work engagement, job satisfaction, and psychological well-being (Bail, Harth, & Mache, 2023; Harunavamwe & Kanengoni, 2023).

Rather than being a unidimensional construct, technostress is conceptualized as a multidimensional phenomenon explained through multiple techno stressors (Roskova et al., 2023; Zhang et al., 2022). According to the most widely accepted classification, technostress consists of techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty. Techno-overload refers to situations in which employees are compelled to work faster and handle more tasks due to technology, whereas techno-invasion reflects the blurring of work–life boundaries through digital tools. Techno-complexity is associated with the difficulty of using technological systems and the high learning requirements they entail. Techno-insecurity involves employees' fear of losing their technological competence, while techno-uncertainty encompasses role and task

ambiguity arising from continuously evolving digital processes (Roskova et al., 2023; Zhang et al., 2022).

Recent research indicates that not all techno stressors exert effects in the same direction. Some techno stressors are perceived as hindrance stressors that increase burnout, whereas others may be evaluated as challenge stressors under certain conditions, potentially triggering employees' motivation for learning and development. This distinction suggests that technostress is not solely a phenomenon producing negative outcomes; rather, it is a dynamic construct capable of generating different work-related outcomes depending on contextual and individual factors (Ramesh et al., 2021; Tarafdar et al., 2019).

In summary, the technostress literature indicates that technological demands strain employees' psychological resources; however, the effects of this process may vary depending on factors such as organizational support, individual resources, and work context. This theoretical framework provides a strong foundation for empirical research examining the relationship between technostress and positive work outcomes such as work engagement and innovative work behaviour.

2.2. Technostress and Innovative Work Behaviour

Innovative work behaviour is a multidimensional construct encompassing employees' generation of new ideas, promotion of these ideas, and their implementation, and it is considered a critical competitive factor in organizations where digitalization is accelerating (Janssen, 2000). However, the emergence of innovative behaviour depends not only on technical knowledge and skills but also on employees' psychological states and their perceived level of stress within the work context. In this respect, the literature indicates that the effects of technostress on innovative work behaviour are complex and context dependent.

A substantial body of empirical research demonstrates that technostress negatively affects employees' innovative work behaviour. Technology-based work overload, complex systems, and expectations of constant availability may deplete employees' cognitive resources, leading them to avoid risk-taking and rely on existing routines. A study conducted in the banking sector revealed that technostress directly reduces innovative work behaviour and that this effect is indirectly strengthened through work engagement (Jain et al., 2025). Similarly, research in engineering and knowledge-intensive jobs shows that technostress weakens individual innovation capacity and produces adverse organizational outcomes (Hessari, Daneshmandi, & Nategh, 2024).

Nevertheless, the literature also suggests that a purely negative perspective on the relationship between technostress and innovative work behaviour may be insufficient. Some studies argue that, at certain levels and under supportive organizational conditions, technostress can be perceived by employees as a challenge stressor that may stimulate innovative behaviour. Particularly in the contexts of remote work and digital transformation, the impact of technostress on

innovative work behaviour has been emphasized as indirect and situational (Forza & Nugroho, 2023; Tarafdar, Cooper, & Stich, 2019).

Psychological mediating mechanisms play an important role in explaining the relationship between technostress and innovative work behaviour. Prior studies indicate that technostress reduces employees' cognitive and emotional energy, thereby weakening the motivational resources required for innovative behaviours. Decreases in work engagement have been identified as one of the key mechanisms explaining the negative effect of technostress on innovative work behaviour (Jain et al., 2025). Conversely, employees with high levels of work engagement are argued to be more resilient in the face of technological demands and more inclined to generate innovative solutions.

Recent models further suggest that the effects of technostress on innovative work behaviour largely occur through indirect mechanisms. Research in academic and knowledge-intensive settings indicates that technostress may weaken individuals' self-efficacy perceptions, leading to resistance to innovation, whereas supportive organizational culture and individual resources can buffer this effect (Zhang, 2023; Yao & Kong, 2023). These findings demonstrate that the impact of technostress on innovative work behaviour is not unidimensional but rather multilayered.

Considering these theoretical and empirical findings, technostress is expected to influence employees' innovative work behaviour both directly and indirectly, with psychological and motivational processes playing a determining role in this relationship. Accordingly, the following hypothesis is proposed:

H1: Technostress negatively affects employees' innovative work behaviour.

2.3. Technostress and Work Engagement

Work engagement is defined as a positive, motivational work-related state characterized by high levels of energy, dedication, and absorption in one's work (Schaufeli et al., 2002). In the literature, work engagement is considered an important psychological resource that enables employees to sustain their performance even under challenging work conditions and to voluntarily contribute to organizational goals. However, technostress emerging in highly digitalized work environments is regarded as one of the key jobs demands that can weaken this positive psychological state.

From the perspective of the Job Demands–Resources (JD-R) model, technology-based demands may create additional cognitive and emotional burdens for employees, thereby negatively affecting their level of work engagement. Empirical studies indicate that dimensions of technostress—particularly techno-overload, constant connectivity, and techno-complexity—deplete employees' energy and reduce their enthusiasm and commitment to work. A multi-method

study conducted in the healthcare sector demonstrated that technostress has a significant and negative effect on work engagement (Bail, Harth, & Mache, 2023). Similar findings have been supported by other studies involving employees who extensively use information and communication technologies (Kot, 2022).

Nevertheless, the literature also suggests that the relationship between technostress and work engagement is not always linear or unidirectional. Some studies argue that when technostress is experienced at low or moderate levels, it may be perceived by employees as a challenge stressor, which can temporarily increase work engagement. An early study conducted in the banking sector reported that technostress could stimulate employee motivation under certain conditions but produced detrimental effects on work engagement when it reached high levels (Okolo, Kamarudin, & Ahmad, 2013). These findings indicate that the intensity and persistence of technostress are critical determinants of its impact on work engagement.

Recent studies emphasize that organizational and individual resources play a crucial buffering role in the relationship between technostress and work engagement. Perceived organizational support, work–life balance practices, and technology-related training opportunities can mitigate the negative effects of technostress on work engagement. Research conducted in hybrid and remote working contexts shows that high levels of techno stressors weaken work engagement; however, appropriate support mechanisms can partially offset this effect (Harunavamwe & Kanengoni, 2023).

In summary, the literature generally indicates that technostress has a negative effect on work engagement, although this relationship may vary depending on employees' perceptions, stress intensity, and available resources. Based on these theoretical and empirical findings, the following hypothesis is proposed:

H2: Technostress has a significant effect on employees' level of work engagement.

2.4. Work Engagement and Innovative Work Behaviour

Work engagement is a positive work-related attitude characterized by employees' high levels of energy, strong dedication, and deep cognitive involvement in their work. Innovative work behaviour, on the other hand, refers to the process through which employees generate new ideas aimed at improving organizational processes, promote these ideas, and implement them in practice. In the literature, the relationship between these two constructs is primarily addressed within motivational and psychological frameworks, and work engagement is emphasized as an important antecedent of innovative work behaviour.

The Job Demands–Resources (JD-R) model is one of the most widely used theoretical frameworks to explain the effect of work engagement on innovative work behaviour. According to this model, when employees possess sufficient job

and personal resources, they develop higher levels of work engagement, and this motivational state facilitates the exhibition of innovative behaviours. Numerous empirical studies have demonstrated that work engagement is positively associated with innovative work behaviour at moderate to strong levels. Indeed, a comprehensive meta-analysis revealed a significant and moderate relationship between work engagement and innovative work behaviour (Sari, Yudiarso, & Sinambela, 2021).

Empirical findings further confirm that employees who are highly engaged in their work are more likely to display innovative work behaviour across different sectors. A study conducted with middle-level managers found that work engagement has a direct and significant effect on innovative work behaviour (Husin et al., 2021). Similarly, research in knowledge-intensive sectors indicates that work engagement increases employees' active participation in idea generation and implementation processes, thereby indirectly contributing to organizational performance (Van Zyl et al., 2019).

The literature also suggests that the effect of work engagement on innovative work behaviour is not only direct but may also function as a mediating or strengthening mechanism within various organizational contexts. Particularly when considered alongside factors such as leadership, human resource practices, and perceived organizational support, work engagement is highlighted as playing a central role in the emergence of innovative behaviours (Viitala et al., 2023; Rumawas, 2024). These findings support the view that work engagement is a fundamental psychological resource that unlocks employees' innovative potential.

In conclusion, both theoretical and empirical studies indicate that work engagement has a significant and positive effect on innovative work behaviour. Therefore, work engagement can be considered a critical factor in explaining employees' innovative behaviours. Based on this rationale, the following hypothesis is proposed:

H3: Work engagement has a significant and positive effect on employees' innovative work behaviour.

2.5. The Mediating Role of Work Engagement

The contemporary literature aiming to explain the effects of technostress on employee behaviour indicates that this relationship often occurs not directly but through various psychological mechanisms. Particularly in work environments where digitalization is accelerating, it is emphasized that technological demands indirectly affect employees' work attitudes and behaviours by weakening their motivational resources. In this context, work engagement emerges as one of the key mediators explaining the relationship between technostress and innovative work behaviour.

The Job Demands–Resources (JD-R) model provides a strong theoretical framework for explaining the effects of technostress on work engagement and how this effect translates into behavioural outcomes. According to the model, techno stressors such as technological overload, constant connectivity, and complex digital systems create increasing job demands for employees, leading to a loss of motivational energy. In this process, the decline in work engagement limits employees' capacity to exhibit innovative behaviours (Kot, 2022; Harunavamwe & Kanengoni, 2023).

Empirical findings support that work engagement functions as a significant mediating mechanism in the relationship between technostress and innovative work behaviour. A comprehensive study conducted in the banking sector reported that the negative effect of technostress on innovative work behaviour largely occurs through a decrease in work engagement and that the indirect effect is significant (Jain et al., 2025). Similarly, research carried out in organizations with intensive use of artificial intelligence–based technologies shows that when technostress is perceived by employees as a hindrance, it reduces work engagement and suppresses innovative work behaviours (Zhang et al., 2025).

However, the literature also indicates that technostress does not always produce negative outcomes; when employees perceive technological demands as a challenge, work engagement may increase, which in turn can support innovative behaviours. This bidirectional effect suggests that the consequences of technostress on innovative work behaviour largely depend on employees' motivational states and levels of work engagement (Ramesh et al., 2021; Zhang et al., 2025).

In conclusion, existing theoretical and empirical studies indicate that the effect of technostress on innovative work behaviour often occurs indirectly through work engagement rather than directly. These findings demonstrate that work engagement is a critical psychological mechanism that protects and channels employees' innovative potential in the face of technostress. Based on this rationale, the following hypothesis is proposed:

H4: Work engagement mediates the relationship between technostress and employees' innovative work behaviour

3. Methodology

3.1. Research Design

This study was conducted within the framework of a quantitative research approach and employed a correlational research design. Correlational designs are widely used in the literature as appropriate methods for examining the direction and strength of relationships between variables (Creswell, 2014). In this study, the effect of perceived technostress levels on innovative work behaviour among employees working in the airline industry was examined, along with the mediating

role of work engagement in this relationship. Accordingly, technostress was treated as the independent variable, work engagement as the mediating variable, and innovative work behaviour as the dependent variable.

The research was carried out using a cross-sectional design, with data collected at a single point in time within a specific period. Cross-sectional designs are commonly preferred in organizational behaviour research for investigating relationships among variables (Spector, 2019). The research model was developed based on previous empirical studies examining the relationships among technostress, work engagement, and innovative work behaviour. Throughout the research process, the principles of the Declaration of Helsinki and the standards of scientific research ethics were strictly followed (World Medical Association, 2013).

3.2. Population and Sample

The population of the study consists of employees working in airline companies operating in Türkiye. In this context, cabin crew, ground services personnel, technical maintenance units, and employees working in office and operations units were included in the research population. The airline industry provides an appropriate research context for examining the effects of technostress on employee behaviours, as it is characterized by the intensive use of digital technologies and the need to work with continuously updated systems.

The sample of the study was determined using a convenience sampling method due to time and accessibility constraints in reaching the population. Convenience sampling is widely used in social sciences, particularly in populations that are difficult to access (Etikan, Musa, & Alkassim, 2016). Voluntary participation was adopted during the data collection process, and efforts were made to reach employees from different functional areas and positions. This approach aimed to ensure that the sample reflects the heterogeneous structure of the sector.

In social sciences, for large or infinite populations, the minimum required sample size to represent the population is generally accepted to be approximately 384–387 participants at a 95% confidence level and a ±5% sampling error (Sekaran, 2003). Considering the large number of airline employees constituting the population of this study, care was taken to ensure that the sample size exceeded this threshold. Within the scope of the research, data were collected from a total of 412 airline employees. This number exceeds the recommended minimum sample size and provides an adequate level of generalizability and statistical power for the study findings.

3.3. Data Collection Instruments

In this study, data were collected using three different instruments.

3.3.1. Personal Information Form

The Personal Information Form includes questions regarding participants' age, gender, educational background, total work experience, tenure at the current workplace, functional area, position, work schedule, weekly working hours, number of digital systems used, intensity of digital system usage, training received for digital systems, daily screen time, work unit, and an attention check item. This information was used to determine the descriptive characteristics of the sample and to control for relevant variables in the analyses.

3.3.2. Work Engagement Scale (UWES-9)

To assess employees' levels of vigour, dedication, and absorption at work, the nine-item short form of the Utrecht Work Engagement Scale (UWES-9) developed by Schaufeli and Bakker (2003) was employed. The Turkish validity and reliability study of the scale was conducted by Özkalp and Meydan (2015). The UWES-9 consists of three sub-dimensions: vigour, dedication, and absorption. Items are rated on a 7-point Likert scale (1 = never, 7 = always). Subscale and total scores were calculated by taking the arithmetic mean of the corresponding items, with higher scores indicating higher levels of work engagement.

For this study, the overall Cronbach's alpha of the scale was 0.90. Examining the sub-dimensions, the alpha coefficient was 0.87 for vigour, 0.86 for dedication, and 0.82 for absorption. Alpha coefficients above 0.80 indicate that the scale provides reliable measurements (Nunnally & Bernstein, 1994).

3.3.3. Innovative Work Behaviour Scale

To measure participants' levels of innovative behaviour in the workplace, the Innovative Work Behaviour Scale developed by De Jong and Den Hartog (2010) was utilized. The Turkish adaptation, validity, and reliability study of the scale was conducted by Vural Özkan (2023). The scale consists of nine items and demonstrates a unidimensional structure. Items are rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The total score was calculated by taking the arithmetic mean of the items, with higher scores indicating higher levels of innovative work behaviour.

For this study, the overall Cronbach's alpha coefficient of the scale was calculated as 0.91. This value indicates that the scale provides a high level of reliability within the research sample (Nunnally & Bernstein, 1994).

3.3.4. Construct Validity

The validity of the measurement instruments was supported by the established adaptation and validation studies conducted for the Turkish versions of the scales. Furthermore, the observed correlations among the study variables were consistent with theoretical expectations and previous empirical findings, providing

additional support for construct validity. The high internal consistency coefficients obtained in the present study also support the adequacy of the measurement instruments. Future studies may employ confirmatory factor analysis (CFA) and additional validity indicators such as Composite Reliability (CR) and Average Variance Extracted (AVE) to further strengthen construct validity evidence.

3.4. Data Collection Process

The data collection process of the study commenced following the ethical approval obtained from the Ethics Committee of Cappadocia University (No: E-64577500-050.99-133779, dated 18.11.2025). The data collection instruments were transferred to an online platform. Participants were asked to complete the questionnaire individually and without any external guidance. The average completion time of the survey was planned to be approximately 8–10 minutes. To reduce potential response errors and careless responding, an attention check item was included in the questionnaire. Responses from participants who failed to answer this item correctly were excluded from the analysis (Meade & Craig, 2012).

The snowball sampling technique was employed to reach participants. In this context, the research process was initially launched through direct contact with employees working in the airline sector. Participants who agreed to take part in the study were asked to share the survey link with other employees within their professional networks. In this way, the sample was gradually expanded through participant referrals. In addition, the survey link was shared in professional groups on messaging applications such as WhatsApp that included employees from different occupational groups within the sector. This approach aimed to facilitate access to employees working in various positions and units and to enhance the diversity of the sample.

Participation in the study was entirely voluntary, and participants were provided with detailed information regarding the purpose, scope, and procedure of the research. Informed consent was obtained from all participants prior to the start of data collection. Participants were clearly informed that they had the right to refuse participation or withdraw from the study at any stage without any negative consequences (World Medical Association, 2013).

Furthermore, participants were informed that the data collected would be used solely for scientific purposes, would not be shared with third parties, and would be stored in accordance with confidentiality principles. The data obtained within the scope of the study were analysed anonymously; no personally identifiable information of the participants was collected or reported. All data were securely stored in environments accessible only to the researchers.

3.5. Data Analysis

The data obtained from the study were analysed using IBM SPSS Statistics 22.0 and the PROCESS Macro v4.2 developed for SPSS. Prior to conducting the analyses, the dataset was examined for missing values, outliers, and basic statistical assumptions (Tabachnick & Fidell, 2013). Within the scope of descriptive statistics, frequency and percentage values were calculated for categorical variables, whereas means and standard deviations were computed for continuous variables.

The normality of continuous variables was assessed by examining skewness and kurtosis coefficients. Values within the ±2 range were interpreted as indicating that the assumption of normal distribution was met (George & Mallery, 2010). The internal consistency of the scales was tested using Cronbach's alpha coefficient, and a value of $\alpha \geq .70$ was considered indicative of acceptable reliability (Nunnally & Bernstein, 1994).

Pearson correlation analysis was conducted to examine the bivariate relationships among the research variables. Linear regression analyses were performed to determine the predictive effects of technostress on innovative work behaviour and work engagement. Prior to regression analyses, the assumption of multicollinearity was evaluated using tolerance and Variance Inflation Factor (VIF) values. Tolerance values above 0.10 and VIF values below 10 indicated that multicollinearity was not a concern (Hair et al., 2014).

To test the mediating role of work engagement in the relationship between technostress and innovative work behaviour, PROCESS Macro Model 4, developed by Hayes (2018), was employed based on a regression-based approach. In this context, total, direct, and indirect effect coefficients were calculated. The statistical significance of the indirect effect was assessed using 95% confidence intervals generated through 5,000 bootstrap samples. If the confidence interval did not include zero, the mediation effect was considered significant (Hayes, 2018; Preacher & Hayes, 2008).

Since the research data were collected from a single source at a single point in time, the risk of common method bias was evaluated. For this purpose, Harman's single-factor test was conducted, and it was determined that the total variance explained by a single factor was below 50%. This finding indicates that common method bias does not pose a serious threat to the study's results (Podsakoff et al., 2003).

In all statistical analyses, the level of significance was set at $p < .05$.

4. Findings

This section presents the results of the statistical analyses conducted based on the data obtained from airline employees participating in the study. First,

descriptive statistics regarding the sociodemographic and occupational characteristics of the participants are reported. Subsequently, the relationships among the main research variables—technostress, work engagement, and innovative work behaviour—are examined. In this context, the findings of correlation, regression, and mediation analyses are reported in line with the research hypotheses and supported by tables (Field, 2018).

Table 1. Distribution of Employees by Descriptive Characteristics

Variable	**Category**	**Frequency (n)**	**Percentage (%)**
Age	20–30	116	28.2
	31–40	217	52.7
	41–50	75	18.2
	51 and above	4	1.0
Gender	Male	238	57.8
	Female	174	42.2
Education Level	High School	81	19.7
	Associate Degree	84	20.4
	Bachelor's Degree	155	37.6
	Graduate Degree	92	22.3
Total Work Experience	1–5 years	82	19.9
	6–10 years	115	27.9
	11–15 years	151	36.7
	16 years and above	64	15.5
Tenure at Current Organization	< 1 year	40	9.7
	1–5 years	159	38.6
	6–10 years	158	38.3
	11 years and above	55	13.3
Functional Area	Cabin Crew	114	27.7
	Office Operations	109	26.5
	Technical Maintenance	76	18.4
	Ground Services	95	23.1
	Other	18	4.4
Position	Team Leader	53	12.9
	Senior Employee	101	24.5
	Manager	30	7.3
	Employee	228	55.3

Variable	Category	Frequency (n)	Percentage (%)
Work Schedule	Day Shift	178	43.2
	Shift Work	178	43.2
	Flexible	56	13.6
Weekly Working Hours	≤ 40 hours	87	21.1
	41–48 hours	212	51.5
	≥ 49 hours	113	27.4
Number of Digital Systems Used	1	49	11.9
	2–3	158	38.3
	4–5	136	33.0
	≥ 6	69	16.7
Intensity of Digital System Use	Very Low	16	3.9
	Low	67	16.3
	Moderate	144	35.0
	High	122	29.6
	Very High	63	15.3
Digital System Training	Yes	262	63.6
	No	150	36.4
Daily Screen Time	< 2 hours	37	9.0
	2–4 hours	138	33.5
	4–6 hours	164	39.8
	> 6 hours	73	17.7
Department	Passenger Services	72	17.5
	Customer Relations	76	18.4
	Planning	61	14.8
	Cargo	73	17.7
	Safety & Quality	62	15.0
	Other	68	16.5

Source: Authors' calculations

According to the findings, the majority of the 412 airline employees participating in the study were in the 31–40 age range (52.7%), and the gender distribution was 57.8% male and 42.2% female. In terms of education level, 37.6% of the participants held a bachelor's degree, 22.3% had a postgraduate degree, 20.4% had an associate degree, and 19.7% were high school graduates. Regarding total work experience, most participants had 11–15 years of experience (36.7%).

IJCEAS
International Journal of Contemporary Economics and Administrative Sciences
ISSN: 1925 – 4423
Volume: XVI, Issue: 1, Year: 2026, pp. 1523-1546

The tenure at the current workplace was largely concentrated between 1 and 10 years (76.9%).

Participants' job areas were predominantly cabin crew and office/operations staff (27.7% and 26.5%, respectively), and more than half of the positions were at the employee level (55.3%). In terms of work schedule, daytime and shift work were equally represented (43.2% each), while weekly working hours were mostly in the 41–48-hour range (51.5%). Regarding digital system usage, most employees reported using 2–5 systems (71.3%) and indicated moderate to high usage intensity (64.6%). Additionally, 63.6% of the participants had received digital system training, and daily screen time was mostly between 2 and 6 hours (73.3%). The distribution across departments shows that customer relations, cargo, and passenger services were prominent, indicating that the sample has a heterogeneous structure representing different functions within the sector (Tabachnick & Fidell, 2013).

Table 2. Descriptive Statistics of the Main Variables in the Study

Variables	**N**	**Mean**	**SD**	**Min.**	**Max.**	**Scale Range**
Technostress (Overall)	412	3.507	0.183	2.920	4.000	1–5
Techno Overload	412	3.521	0.325	2.500	4.500	1–5
Techno-Complexity	412	3.508	0.295	2.600	4.200	1–5
Techno-Uncertainty	412	3.492	0.332	2.750	4.500	1–5
Innovative Work Behavior	412	4.675	0.173	4.110	5.000	1–5
WorkEngagement (Overall)	412	6.384	0.217	5.670	6.890	1–7
Vigor	412	6.352	0.400	4.670	7.000	1–7
Dedication	412	6.392	0.391	5.330	7.000	1–7
Absorption	412	6.406	0.365	5.330	7.000	1–7

Source: Authors' calculations

An examination of the descriptive statistics presented in Table 2 indicates that the overall level of technostress among participants is above the midpoint (M = 3.507, SD = 0.183). In five-point Likert scales, a mean score above the scale midpoint suggests a relatively high perceived level of the construct (Field, 2018). When the sub-dimensions of technostress are evaluated, the mean scores for techno-overload (M = 3.521, SD = 0.325), techno-complexity (M = 3.508, SD = 0.295), and techno-uncertainty (M = 3.492, SD = 0.332) appear to be quite close to each

other. This finding indicates that employees experience technostress in a multidimensional yet relatively balanced manner. The literature similarly suggests that intensive digital system usage can generate comparable levels of different technostress components among employees (Tarafdar et al., 2007).

Regarding innovative work behaviour, the mean score is notably high (M = 4.675, SD = 0.173), with values approaching the upper limit of the scale range. The high average level of innovative work behaviour suggests that employees demonstrate strong tendencies toward generating new ideas, promoting these ideas, and implementing them (Janssen, 2000). This finding is consistent with previous studies indicating that innovative behaviours are encouraged in dynamic and technology-intensive sectors such as aviation.

The overall mean score for work engagement is also remarkably high (M = 6.384, SD = 0.217). In terms of sub-dimensions, vigour (M = 6.352, SD = 0.400), dedication (M = 6.392, SD = 0.391), and absorption (M = 6.406, SD = 0.365) display similar values and are close to the upper limit of the scale range. The high levels of work engagement indicate that employees approach their work with high energy, strong commitment, and deep concentration. This result aligns with prior findings suggesting that higher levels of work engagement are associated with increased performance and positive work outcomes (Schaufeli et al., 2002).

Overall, it can be concluded that innovative work behaviour and work engagement levels are high within the sample group, whereas technostress levels fall within the moderate-to-high range. This finding is consistent with previous research demonstrating that employees in technology-intensive work environments may simultaneously experience digital-related stress while maintaining high levels of motivation and innovativeness (Tarafdar et al., 2015).

Table 3. Results of the Pearson Correlation Analysis Among Technostress, Work Engagement, and Innovative Work Behaviour

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1. Technostress (Overall)	1.00								
2.Techno Overload	.588**	1.00							
3.Techno-Complexity	.580**	−.015	1.00						
4.Techno-Uncertainty	.575**	.093	−.053	1.00					
5.Innovative Work Behavior	−.381**	−.354**	−.328**	.027	1.00				

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
6.Work Engagement (Overall)	−.493**	−.450**	−.428**	.031	.622**	1.00			
7. Vigor	−.308**	−.533**	.013	−.046	.399**	.593**	1.00		
8. Dedication	−.291**	−.156**	−.354**	.023	.380**	.579**	.000	1.00	
9. Absorption	−.228**	−.051	−.399**	.082	.265**	.513**	−.039	-.040	1.00

Note. N = 412. **p** < .01 (two-tailed).

Source: Authors' calculations

An examination of the Pearson correlation results presented in Table 3 indicates that there is a moderate, negative, and statistically significant relationship between overall technostress and innovative work behaviour ($r = -0.381$, $p < 0.01$). Correlation coefficients with absolute values between .30 and .50 are considered to represent a moderate relationship (Cohen, 1988). Similarly, a moderate, negative, and significant relationship was found between overall technostress and overall work engagement ($r = -0.493$, $p < 0.01$). These findings suggest that as employees' perceived technostress increases, both their innovative work behaviour and work engagement levels tend to decrease. The literature likewise emphasizes that technostress may negatively affect employees' motivation and their integration with work (Tarafdar et al., 2007; Tarafdar et al., 2015).

When the sub-dimensions of technostress are examined, techno-overload shows a negative and significant relationship with innovative work behaviour ($r = -0.354$, $p < 0.01$). Similarly, techno-complexity is negatively and significantly related to innovative work behaviour ($r = -0.328$, $p < 0.01$). In contrast, no statistically significant relationship was found between techno-uncertainty and innovative work behaviour ($p > 0.05$). This finding suggests that perceived workload and system complexity may be more decisive stressors affecting innovative behaviours. Previous studies also indicate that excessive workload and technological complexity can suppress employees' creative and innovative performance (Ayyagari, Grover, & Purvis, 2011).

From the perspective of work engagement, the results show negative and significant relationships between overall technostress and the vigour, dedication, and absorption sub-dimensions of work engagement ($p < 0.01$). This finding is consistent with the Job Demands–Resources (JD-R) model, which proposes that increasing job demands may reduce employees' energy and level of engagement with their work (Bakker & Demerouti, 2007).

On the other hand, a strong, positive, and significant relationship was found between overall work engagement and innovative work behaviour ($r = 0.622$, $p < 0.01$). Examination of the sub-dimensions reveals that vigour, dedication, and

absorption are all positively and significantly associated with innovative work behaviour. This result is consistent with prior research showing that employees who are highly engaged in their work are more willing to generate and implement new ideas (Schaufeli & Bakker, 2004; Janssen, 2000).

Overall, the findings indicate that technostress plays a detrimental role in work engagement and innovative work behaviour, whereas work engagement strongly supports innovative work behaviour. This pattern suggests that employees' psychological resources constitute a critical mechanism for innovative outcomes in technology-intensive work environments.

Table 4. Regression and Mediation Analysis Results Regarding the Mediating Role of Work Engagement in the Effect of Technostress on Innovative Work Behaviour

Dependent Variable	**Independent Variable**	**β**	**SE**	**t**	**p**	**95%CI Lower**	**95%CIUpper**
Work Engagement	Technostress (a)	-0.493	0.051	11.465	0.000	-0.682	-0.483
	R = 0.493; R² = 0.243; F = 131.436; p = 0.000						
Dependent Variable	**Independent Variable**	**β**	**SE**	**t**	**p**	**95%CI Lower**	**95%CI Upper**
Innovative Work Behavior	Technostress (c)	-0.381	0.043	-8.335	0.000	-0.442	-0.274
	R = 0.381; R² = 0.145; F = 69.477; p = 0.000						
Dependent Variable	**Independent Variable**	**β**	**SE**	**t**	**p**	**95% CI Lower**	**95% CI Upper**
InnovativeWork Behavior	Technostress (c′)	-0.098	0.042	-2.213	0.028	-0.174	-0.010
	Work Engagement (b)	0.574	0.035	12.981	0.000	0.387	0.526
	R = 0.628; R² = 0.394; F = 133.182; p = 0.000						

Effects Summary

Effect Type	**β**	**SE**	**t**	**p**	**95%CI Lower**	**95% CI Upper**
Total Effect	-0.358	0.043	-8.335	0.000	-0.442	-0.274
Direct Effect	-0.092	0.042	-2.213	0.028	-0.174	-0.010
Indirect Effect	-0.283	0.031	—	—	-0.347	-0.224

Source: Authors' calculations

The results of the regression analysis conducted to examine the direct effect of technostress on innovative work behaviour indicate that technostress has a

negative and statistically significant effect on innovative work behaviour (β = −0.3579, SE = 0.0429, t = −8.34, p < .001). This model explains 14.49% of the total variance in innovative work behaviour (R^2 = .1449). The negative regression coefficient suggests that as the level of technostress increases, employees' tendency to exhibit innovative behaviour decreases. This finding is consistent with previous studies indicating that technology-related stress may suppress employee performance and creativity (Tarafdar et al., 2007; Ayyagari, Grover, & Purvis, 2011). Accordingly, **H1 was supported**.

The analysis examining the effect of technostress on work engagement revealed that technostress is a negative and significant predictor of work engagement (β = −0.5825, SE = 0.0508, t = −11.46, p < .001). In this model, technostress explains 24.28% of the variance in work engagement (R^2 = .2428). The findings suggest that increasing technological demands may reduce employees' levels of energy, dedication, and absorption. This result is consistent with studies within the Job Demands–Resources (JD-R) model framework indicating that job demands are associated with employee burnout and lower engagement (Bakker & Demerouti, 2007). Therefore, **H2 was supported**.

The regression analysis conducted to examine the effect of work engagement on innovative work behaviour shows that work engagement positively and strongly predicts innovative work behaviour (β = 0.4565, SE = 0.0352, t = 12.98, p < .001). In the model where technostress and work engagement were included together, the total explained variance was 39.44% (R^2 = .3944). This finding is consistent with prior research indicating that highly engaged employees behave more proactively in generating and implementing new ideas (Janssen, 2000; Schaufeli & Bakker, 2004). Accordingly, **H3 was supported**.

To test the mediating role of work engagement in the relationship between technostress and innovative work behaviour, a mediation analysis was conducted using PROCESS Macro Model 4 (Hayes, 2018). The analysis indicated that the total effect of technostress on innovative work behaviour is negative and significant (β = −0.3579, SE = 0.0429, p < .001).

When work engagement was included in the model as a mediator, the direct effect of technostress on innovative work behaviour decreased but remained statistically significant (β = −0.0920, SE = 0.0416, p = .027). The reduction in the direct effect while remaining significant indicates **partial mediation** according to the classical mediation approach (Baron & Kenny, 1986).

Bootstrap results for the indirect effect demonstrated that work engagement plays a statistically significant mediating role in the relationship between technostress and innovative work behaviour (indirect effect = −0.2659, BootSE = 0.0329). The 95% bootstrap confidence interval did not include zero (BootLLCI = −0.3350, BootULCI = −0.2058), confirming the significance of the mediation effect. The literature emphasizes that the bootstrap approach provides higher statistical power in mediation analyses (Hayes, 2018; Preacher & Hayes, 2008). The fully standardized indirect effect coefficient was also found to be significant (β

= −0.2828), indicating that work engagement is an important psychological mechanism in this relationship.

Based on these findings, it was concluded that work engagement is a significant mediating variable in the relationship between technostress and innovative work behaviour, and **H4 was supported**.

6. Conclusion, Limitations, and Future Research

This study examined the effect of technostress on innovative work behaviour among airline employees and the role of work engagement in this relationship, thereby providing important insights into the psychological mechanisms through which digitalization influences employee behaviour. The findings indicate that technostress directly and negatively affects innovative work behaviour and reduces the level of work engagement. In contrast, work engagement was found to be a strong and positive predictor of innovative work behaviour. These results are consistent with previous studies suggesting that technostress may weaken innovative performance by depleting employees' cognitive and motivational resources (Tarafdar et al., 2015; Zhang et al., 2022).

The most significant finding of the study is that work engagement plays a partial mediating role in the relationship between technostress and innovative work behaviour. This result demonstrates that the effects of technostress on innovative work behaviour are largely shaped through employees' motivational states. Accordingly, technostress should be evaluated not merely as a technological issue but as a multidimensional organizational phenomenon that affects employees' psychological resources. This finding is consistent with the exhaustion and motivational processes proposed by the Job Demands–Resources (JD-R) model (Bakker & Demerouti, 2007; Ferreira & Valentini, 2021). Overall, the results highlight that managing technostress and supporting work engagement are critically important for preserving and enhancing the innovative potential of employees in the highly digitalized airline industry.

This research contributes theoretically to the literature by explaining the effect of technostress on innovative work behaviour not only through direct relationships but also by addressing work engagement as a mediating mechanism. The findings extend the explanatory framework of the JD-R model by demonstrating that technostress influences employee behaviour through motivational processes (Bakker & Demerouti, 2017; Lee & Jo, 2023). Furthermore, the study shows that innovative work behaviour is shaped not only by individual or organizational factors but also by psychological responses to digital job demands (Janssen, 2000; Pansini et al., 2023). Conducting the study in the airline industry provides an original contribution to the limited body of research examining the technostress–motivation–behaviour relationship in technology-intensive contexts (Ramesh et al., 2021).

From a practical perspective, the findings indicate that digital transformation processes should be managed not only from a technological standpoint but also

through a human-centred approach (Tarafdar et al., 2015). Increasing training related to technology use, developing user-friendly system designs, and establishing strong technical support mechanisms may help reduce technostress (La Torre et al., 2019). Moreover, given the protective role of work engagement, participative leadership practices, fair workload distribution, flexible working arrangements, and psychological support mechanisms may strengthen employee engagement and sustain innovative behaviours (Schaufeli, 2017; Bakker & Albrecht, 2018). An additional finding that deserves attention is the relatively high levels of work engagement and innovative work behaviour reported by airline employees. One possible explanation is the highly dynamic and technology-intensive nature of the airline industry. Employees frequently operate in environments requiring continuous coordination, rapid decision-making, strict adherence to safety procedures, and intensive interaction with digital systems. Such conditions may foster stronger professional commitment, proactive behaviour, and greater involvement in work processes. Furthermore, increasing digital transformation initiatives and competitive pressures within the aviation sector may encourage employees to actively participate in innovation and process improvement activities, resulting in elevated levels of work engagement and innovative work behaviour.

6.1. Limitations and Future Research

This study has several limitations. First, the data were collected at a single point in time using a self-report method, which limits causal inferences. Future studies may employ longitudinal designs to examine the effects of technostress over time in greater detail (Podsakoff et al., 2003). Second, the research sample was limited to employees in the airline industry. This may restrict the generalizability of the findings. Future research is recommended to test similar models in different technology-intensive sectors to enable cross-sector comparisons (Ragu-Nathan et al., 2008). Finally, this study considered only work engagement as a mediating variable. Future studies may incorporate variables such as burnout, psychological resilience, perceived organizational support, or technological competence into the model to examine the effects of technostress on employee behaviours more comprehensively (Bakker & Demerouti, 2017). Although Harman's single factor test suggested that common method bias was not a significant concern in this study, it has been recognized as having limitations in detecting all forms of common method variance. Accordingly, future studies are encouraged to employ more robust statistical approaches, such as marker variables or CFA-based techniques, to further evaluate and control for common method bias.

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