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RESEARCH ARTICLE

The Examination of Factors Affecting Pilot Motivation with Structural Equation Modeling

Pilot Motivasyonuna Etki Eden Faktörlerin Yapısal Eşitlik Modeli ile İncelenmesi

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Abstract

The primary responsibility of a pilot is to ensure aircraft control and security during the entire flight. Considering the vital nature of the job, pilots are expected to possess strong motivation, which is an important characteristic. Pilot motivation can be influenced by factors including concentration, lifestyle activities, communication, external triggers, stress, leadership, job satisfaction, and burnout. This study aims to examine the factors that influence pilot motivation. The study utilized structural equation modeling to analyze causal relationships within a theoretical framework and assess its statistical validity. In this context, submitted hypotheses explore the causal links influencing pilot motivation and the indicators that represent these characteristics. An online survey was done with a group of 256 civilian and military pilots. The survey findings were imported into SmartPLS software for analysis of the factors. The research results determined the most and least important factors causing the diversity in pilot motivation.

Keywords: Pilot Motivation, Structural Equational Modelling, SmartPLS

Öz

Pilotun öncelikli görevi uçuş esnasında hava taşıtlarının kontrolünü ve güvenliğini sağlamaktır. Yaptığı işin kritik önemi sebebiyle motivasyonun yüksek olması bir pilottan beklenen en temel özelliklerden biridir. Konsantrasyon, yaşam aktiviteleri, iletişim, dış etmenler, stres, liderlik, iş tatmini ve tükenmişlik gibi faktörler pilot motivasyonun etkileyebilir. Bu çalışmanın amacı pilot motivasyonuna etki eden bu faktörleri analiz etmektir. Kurulan teorik çerçevede nedensellik ilişkisi inceleyen ve bu çerçevenin istatistiksel anlamda geçerliliğini test eden yapısal eşitlik modellemesi yöntemi uygun yöntem olarak seçilmiştir. Bu bağlamda pilot motivasyonuna etki eden nedensel ilişkiler hakkında hipotezler ve faktörleri işlevsel hale getiren göstergeler önerilmiştir. Sivil ve askeri pilotlardan oluşan 256 kişilik bir gruba çevrimiçi anket uygulaması gerçekleştirilmiştir. Anket sonuçları SmartPLS yazılımına aktarılmış ve faktörler analiz edilmiştir. Araştırmanın sonuçlarına göre pilot motivasyondaki değişkenliği açıklayan en önemli faktör ile en az önemli faktör tespit edilmiştir.

Anahtar Kelimeler: Pilot Motivasyonu, Yapısal Eşitlik Modellemesi, SmartPLS

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1. INTRODUCTION

Pilots are one of the most important resources in the aviation sector [1]. Pilots must enhance their knowledge, abilities, and behaviors comprehensively to effectively and safely operate aircraft [2]. However, pilots may encounter behavioral and cognitive problems like loss of concentration and slowed reaction times owing to factors like excessive exhaustion, stress, and burnout [3]. Issues of this nature are among the factors that lead to aviation accidents. Therefore, pilots must possess high motivation in order to operate aircraft effectively and securely [3].

Motivation can be defined basically as the interaction between energy and direction. The energy dimension of motivation provides the impetus for an individual's labor during the performance of a task. The area where the endeavor is emerging is defined by the direction dimension. Both dimensions are necessary for full motivation. Energy without direction is purposeless; direction without energy leads to a lack of motivation [4].

Apart from the levels of individual motivation, the orientation of motivation can experience changes. Motivational orientation refers to the basic reasons or objectives behind acting and is categorized into intrinsic and extrinsic motivation [5].

Intrinsic motivation refers to an individual's inherent excitement for a task or activity [6]. An individual with intrinsic motivation is not influenced by extrinsic pressures or rewards. Individuals usually perform things due to their enjoyment [6]. Individuals that have intrinsic motivation tend to exhibit higher levels of productivity and creativity, succeed in their professional jobs, and are eager to explore new opportunities [6].

Extrinsic motivation refers to when an individual acts to obtain an external reward or avoid punishments, in contrast to intrinsic motivation [5-6]. Ryan’s and Deci's extrinsic motivation has been evaluated in four different categories.

i. External Regulation: It is usually carried out to meet obligations, follow standards, or obtain the reward presented.
ii. Introjection: This motivation includes the individual internalizing their duties for the activity, eliminating feelings of guilt, and attempting to protect their self-esteem.
iii. Identification: It is the motivation that arises when an individual acknowledges that the result of their actions carries significant consequences and desires to act accordingly.
iv. Integration: The individual completely integrates behavior despite its dependence on external factors.

A review of the literature related to pilot motivation has been done as follows.

Ruiz [7] has studied how risk and pilot motivation influence pilots' decision-making. Three distinct accidents were analyzed, comparing risk factors including aircraft type, environmental conditions, external pressures, and pilots' motivations for continuing to fly. The investigation revealed that some rational facts could positively influence pilot motivation. The cause of pilot motivation may be attributed to a strong sense of responsibility for passengers.

Frederick-Recascino and Hall [4] investigated whether pilot motivation relates to the flight performance of student pilots at an aviation university using the multiple regression method. Student motivation, measured by the number of times the student canceled flight lessons, has been found to be the factor that explained a significant amount of flight performance.

Marshburn [8] has examined the factors that motivate pilots to enhance their flight experience and assessed the impact of these factors using a multiple regression model. Being assigned as pilot-in-command and recording flying hours has been determined as the most significant factor in determining the total flight experience. Intrinsic motivation has been considered insignificant in relation to flight experience.

Forsman [9] has investigated a potential difference between the pilots' internal motivation and their overall flight experience. The t test has indicated that those in the high motivation group had significantly less flight experience than those in the low motivation group. A substantial association has been found between the pilot's professionalism and flight performance.

Based on existing literature, many factors have been found to be influential in determining the flight performance and motivation of pilots. These factors include concentration, lifestyle activities, communication, external triggers, leadership, job satisfaction, and burnout. To the best of our knowledge, no comprehensive study has been found that evaluates the effects of all factors on pilot motivation simultaneously. Therefore, the goal is to address this deficiency in the literature by undertaking a research investigation on this topic. In this context, the structural equation model has been chosen as the appropriate approach to examine the influence of the determined factors on pilot motivation. A total of 256 pilots participated in an online survey to collect data. The analysis involved the construction of a partial least squares structural equation (PLS) model in SmartPLS software to assess the statistical significance and strength of relationships among factors.

2. STRUCTUAL EQUATION MODELLING (SEM)

Structural equation modeling (SEM) is a widely used methodology across various fields for the purpose of examining and interpreting causal relationships among multiple variables [10]. The method is a statistical technique that has been in use for over a century and has undergone continuous advancements throughout three generations [11].

The first generations of SEMs used path analysis to develop causal modeling logic [11]. Following on, SEM had a conversion into an approach based on factor analysis in the social sciences. The second generation enabled the increased utilization of SEM [11]. The multivariate analysis method known as SEM's "second generation" has garnered significant attention as a crucial statistical development in the field of social sciences in recent years [11]. SEM provides simultaneous modeling and prediction of complex relationships among multiple dependent and independent variables [12]. In addition, enhancing the user interfaces of the programs used has facilitated the approach's usability. This has facilitated the wide-ranging implementation of empirical investigations

and theoretical research in various fields of study [13]. The development of a structural causal model was the focus of third generation SEM. Following that, Bayesian modeling was integrated into the related model [14].

In comparison to statistical methods such as multiple regression and factor analysis, SEM's strength is its ability to perform factor analysis and path analysis at the same time. Because the SEM approach enables the measurement of observed value errors, the representation of hidden variables through a variety of indicators, and an investigation of the causal relationship between hidden variables and open variables [13].

Covariance-based techniques CB-SEM and variance-based partial least squares PLS-SEM methods are used to estimate relationships in the structural equation model [15]. CB-SEM is mainly applied to verify (or reject) theories, which are a collection of systematic relationships between different factors that can be empirically verified [16]. It accomplishes this by evaluating the ability of a proposed theoretical model to accurately estimate the covariance matrix for a given set of sample data. On the other hand, structural equation modeling (SEM) has presented PLS as a "causal-predictive" method, with a specific emphasis on elucidating the variability in the dependent variables [16]. PLS-SEM can be useful in situations when research relies on secondary/archival data that may have little evidence based on measurement theory [17]. PLS-SEM aims to minimize the unexplained variation in the dependent constructs of the structural model and the indicators of the measurement model in order to make predictions [18]. CB-SEM focuses on making predictions, while PLS-SEM prioritizes predictions and also underlined explanation [19]. Additionally, it has been seen that this approach yields successful results when the model has no basis in an exact theoretical structure [15]. PLS-SEM uses principal components analysis and regression-based path analysis to estimate the parameters of a set of equations in a structural equation model [20]. The method provides many advantages to researchers using cause-effect relationship models to clarify or predict a certain structure [20]. These advantages encompass its ability to: (1) handle complex model with many indicators and constructs; (2) estimate formally specified constructs; (3) deal with small sample sizes; (4) derive latent variable scores used for analysis [20]. PLS-SEM successfully deals with the limitations of covariance-based SEM, particularly in research scenarios with complicated research models and limited data resources [20].

PLS-SEM has been evaluated as the most appropriate method for explaining and predicting causal connections between latent factors affecting pilot motivation. For each variable, the reliability and validity of the indicators used in the measurement model have been tested.

A description of some test criteria for measurement values is given below.

1. Internal Consistency Reliability (IC) is a measure that reflects the internal consistency of the study, and Cronbach's alpha and Composite Reliability coefficients are expected to be 0.7 or higher [19].
2. Indicator Reliability (IR): It indicates the degree to which the variance of each indicator is accounted for by its corresponding construct. The squares of the

indicator loadings express the reliability of the indicators. In the literature, three separate strategies have been proposed to ensure the reliability of indicators [19].

If the indicator load is less than 0.4, the expression must be removed from the system, if it is greater than 0.7, it should be left in the same state; If it is between 0.4 and 0.7, it must be removed and it must be checked whether the AVE and CR values have increased; if there is an increase, these indicators must be excluded [19].

3. Convergent Validity (CV): It expresses the degree of relationship between elements belonging to the same latent structure. The AVE value should be greater than 0.5 to ensure convergent validity [19].
4. Discriminant Validity (DV): It shows the differences between the latent constructs present in the model and those of other latent constructs. The research used the Fornell-Larcker criterion for this test. In Table 5, the reliability and validity estimations for all latent variables are shown [19].

3. IMPLEMENTATION

A structural model has been developed based on a literature review to clarify the impact of certain factors on pilot motivation. Research on factors influencing pilot performance has also been reviewed.

The flight performance of the pilot may exhibit variability depending on certain conditions. Multiple studies have demonstrated that various factors, including cabin ergonomics and the visualization of fundamental flight data, cockpit noise levels, carbon dioxide levels within the cabin, and the shift from analog to digital screens, have an impact on flight performance [2, 21-23]. The relevant variables have been evaluated within the main category of external factors that have the potential to impact pilot motivation.

The execution of air-traffic controller communications has a crucial role in assessing pilots' performance [24]. In pilot communication, the notions of timing, technique, and the appropriate receiver have significant importance. In addition, pilots engage in communication in obedience to specified flying protocols. Pilots are required to communicate information in a concise and effective way, in particular in flight. The potential consequences of a mistake caused by inadequate or inaccurate communication can be significant. In view of this explanation, the assessment of the factor of communication was considered significant in relation to pilot motivation [25].

Pilots have the main responsibility of ensuring the safety of flights. To be able to accomplish this, pilots must perform many responsibilities, including the management of electronic systems and cockpit indications, maintaining effective communication with air traffic, and making appropriate decisions in adverse weather conditions [26]. Nevertheless, with the increase in variables requiring control, there is a corresponding rise in stress factors emerging from the environment. Research has shown that heightened stress levels, resulting from various emotional elements such as worry, fear, anxiety, and environmental disappointments, negatively impact flight performance [27-28]. Because when stress is experienced at high levels, individuals spend all their strength

to cope with it [29]. The use of maximum effort results in a decline in both motivation and performance. Hence, the impact of stress on pilot motivation has been evaluated.

The acquisition of life skills is essential for effectively managing the challenges that may arise in a professional life. Life skills comprise a variety of human abilities required to enhance their value and standard living. Basic life skills encompass a range of essential abilities, including nutrition, sleep, providing and maintaining a safe environment, physical movement, effective communication, decision-making, problem-solving, creative thinking, self-awareness, and empathy. Pilots require the ability to effectively utilize life skills to achieve success in their profession and maintain an optimal balance between their professional and personal lives [30]. For this reason, life skills have been considered among the factors that directly affect pilot motivation.

Leadership is the combination of essential attributes required to direct a certain society towards a particular goal and efficiently organize it [31]. Leadership in the aviation industry is defined by the capacity to effectively guide the actions of team members, develop an atmosphere of cooperation, promote a collaborative mindset, and demonstrate proactive behavior. Pilots' evaluations of related activities directly influence team members' attitudes and behaviors. This also impacts the quality of the flight. In this context, when the leadership dimension was examined through the concept of flight performance, it was seen that it had a significant and positive relationship [32].

Job satisfaction is a positive and pleasurable sensation that arises from an individual's assessment of their job or work experience [1]. Job satisfaction is necessary for motivation to occur. The findings of a study indicate the presence of a moderate correlation between job satisfaction and motivation [33]. The evaluation of the job satisfaction factor has been conducted to assess its impact on pilot motivation.

It has been defined that concentration is the capacity to sustain focus with diligence [34]. Pilots require high levels of concentration to remain alert and focused throughout long flights and periods of time [35]. However, these levels of concentration and attention can be diminished by various factors, and the pilot may become distracted, which can have a severe impact on flight safety [36]. Therefore, concentration was assessed as one of the variables influencing pilot motivation.

Burnout is defined as a gradually developing process that arises from a basic incongruity between the demands of a job and the requirements of the individuals performing the job [37]. Unsteady and extended work schedules, as well as changing vacation days, have an impact on the social lives of pilots and impose a mental and physical load. In addition, the sleep quality of pilots may be reduced because of their frequent accommodations in hotels. Pilots suffering inadequate sleep and rest durations observed increased levels of fatigue. All the mentioned causes lead to the occurrence of burnout. Pilots suffering burnout reveal a decline in their performance. Burnout has a negative effect on the performance of pilots, resulting in a decline in the quality of their job.

The proposed structural model is presented in Figure 1. The literature review shows the limited number of studies on pilot motivation. Existing studies select the most recurring

and thought to be important criteria that affect pilot motivation. In this context, we have determined the scope of the criteria that influence pilot motivation.

The hypotheses that aim to uncover the relationships between the determined factors and the eight dimensions of the latent structure of pilot motivation are given Table 1.

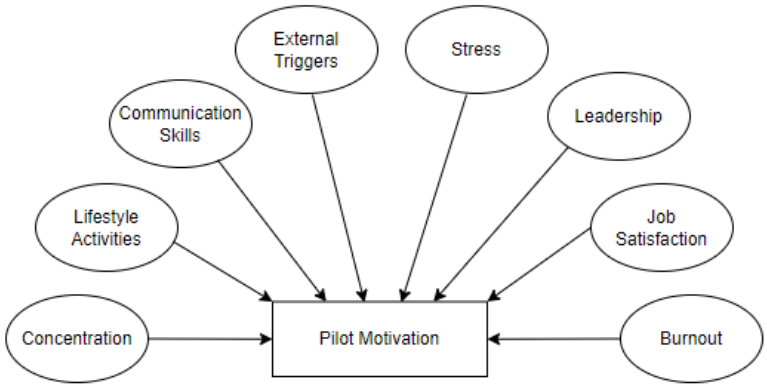

Figure 1. The proposed structural model.

Table 1. Hypotheses.

Hypothesis H1: Concentration has a positive effect on pilot motivation.
Hypothesis H2: Lifestyle activities have a positive effect on pilot motivation.
Hypothesis H3: Communication skills have a positive effect on pilot motivation.
Hypothesis H4: External triggers have a negative effect on pilot motivation.
Hypothesis H5: Stress has a negative effect on pilot motivation.
Hypothesis H6: Leadership has a positive effect on pilot motivation.
Hypothesis H7: Job satisfaction has a positive effect on pilot motivation.
Hypothesis H8: Burnout has a negative effect on pilot motivation.

This study used a set of 34 survey questions that were prepared through a comprehensive review of relevant literature and expert views, as indicators. The survey was sent to pilots using the "Google Forms" application. The survey consists of two parts. The first part includes the demographic characteristics of pilots, such as age, gender, type of airplane, and hour of flight. The second part measures the observed variables associated with the pilots' motivations. The descriptive statistics of the pilots' demographic characteristics are summarized in Table 2. The survey's second part utilizes a 5-point Likert scale for scaling. The scales consist of 1 (I strongly disagree), 2 (I disagree), 3 (I am undecided), 4 (I agree), and 5 (I completely agree).

The content of the survey questions can be classified as follows.

Concentration: The survey included questions aimed at assessing the pilots' level of concentration and attentiveness to their duties [38].

Lifestyle activities: It asked pilots questions about their sleep patterns and quality, which are important for their health, adequate and balanced eating habits, and regular physical activity and sports [39].

Communication skills: The survey included questions aimed at quantifying the impact of various thoughts, including communication skills, cohesiveness in the team, the influence of daily talks, and empathic communication [40].

External triggers: Pilots were asked questions about professional motivation, profession and personality compatibility, work-life balance, professional challenges and responsibilities, working conditions, and the impact of training and development tools on professional skills [41].

Stress: Questions were asked to measure the pilot's self-efficacy perception, which evaluates his confidence and competence in his ability to make decisions in emergency situations, the general stress level in the work environment, and his social anxiety level, which evaluates the anxiety and stress he feels in situations that require social interaction such as meetings [42].

Leadership: The survey included questions that assessed individuals' understanding of duty awareness and responsibility, professionalism, and decision-making skills [40].

Job satisfaction: The survey questions prepared are as follows: include recognition and appreciation; financial satisfaction; competence utilization, which evaluates whether the job offers the opportunity to use and develop the individual's talents and skills; professional prestige; the evaluation of employees' achievements and contributions; free will, which measures whether employees have the freedom to act independently in their work and make their own decisions [43].

Burnout: The Maslach Burnout Inventory, an evaluation scale used to measure employees' burnout levels, was used for the survey questions of the relevant latent variable. Emotional exhaustion, which refers to the individual feeling extremely tired and exhausted due to the workload, depersonalization, which refers to the individual becoming emotionally distant from work, indifferent and indifferent to job and people, and personal achievement, which refers to the individual experiencing a feeling of inadequacy and failure in job [44]. The pilots were questioned about these subjects.

Table 2. Demographic characteristics of participants.

	Sample size (n)	Ratio (%)
Gender		
Female	26	10.15
Male	230	89.85
Total	256	100
Age		
18-24	118	46.09
25-32	72	28.12
33-42	40	15.62
43-55	26	10.15
Type of Airplane		
Fighter Interceptor	72	28.12
Training	132	51.56
Transporter	12	4.68
Passenger	30	11.71
Helicopter	10	3.9
Flight Hours		
0-500	172	67.18
500-1250	12	4.68
1250-2000	16	6.25
2000-3000	24	9.37
3000 plus	32	12.5

The model contained a total of 34 indicator dependent and independent variables. At the outset, 58.7% was the coefficient of determination (R2) associated with the dependent variable pilot motivation. However, because of low factor loads and increasing mean variance, nine indicators were removed from the model, with two indicators representing job satisfaction, one indicator representing stress, one indicator representing communication, two indicators representing external triggers, and two indicators representing burnout. Following that, improvements were made to the model. The revised model is shown in Figure 2. The independent latent variable that affected the motivation-dependent variable the most was stress, and the independent latent variable that affected it the least was lifestyle activities. The measurement results related to the indicators of the variables in the revised model are given in Table 3. The measurement results contain outer loadings, indicator reliability, composite reliability, AVE values of the indicators.

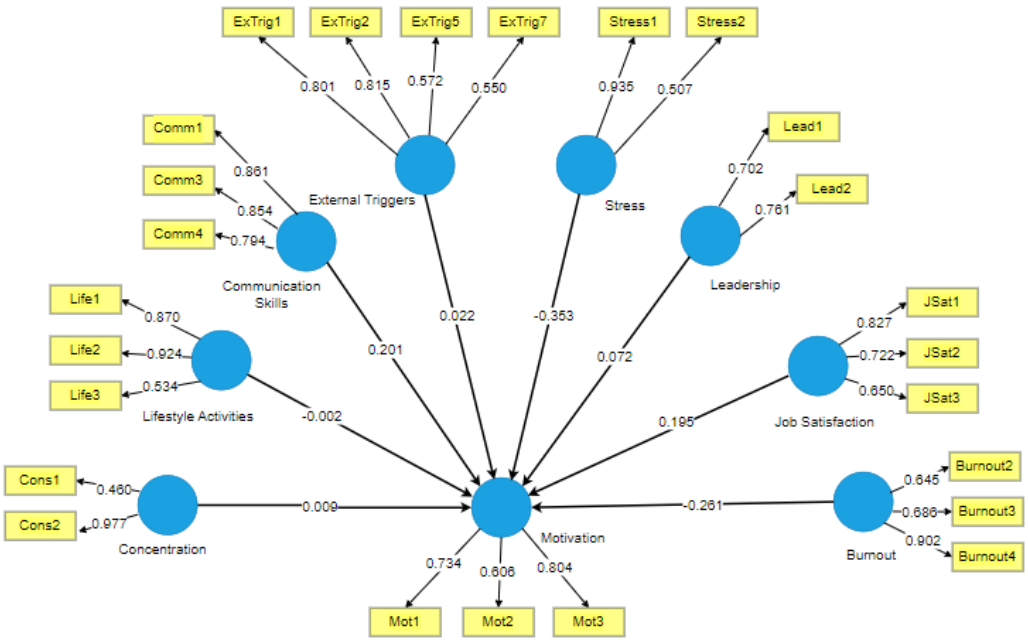

Figure 2. Revised model.

Table 3. Loadings, reliability and validity estimates of the construct for all latent variables.

Latent Variable	Indicators	Outer loadings	Indicator reliability	Composite reliability	AVE
Concentration	Cons1	0.460	0.211	0.712	0.583
	Cons2	0.977	0.954		
Lifestyle Activities	Life1	0.870	0.756	0.784	0.484
	Life2	0.924	0.853		
	Life3	0.534	0.285		
Communication	Com1	0.861	0.741	0.875	0.70
	Com3	0.854	0.729		
	Com4	0.794	0.630		
External Triggers	ExTrig1	0.801	0.641	0.784	0.484
	ExTrig2	0.815	0.664		
	ExTrig5	0.572	0.327		
	ExTrig7	0.550	0.302		
Stress	Stress1	0.935	0.874	0.706	0.566
	Stress2	0.507	0.257		
Leadership	Lead1	0.702	0.492	0.698	0.536
	Lead2	0.761	0.579		
Job Satisfaction	JSat2	0.827	0.683	0.779	0.543
	JSat3	0.722	0.521		
	JSat4	0.650	0.422		
Burnout	Burnout2	0.645	0.416	0.793	0.567
	Burnout3	0.686	0.470		
	Burnout4	0.902	0.813		

In structural equation modeling, motivation is the dependent variable. We have prepared survey questions on professional attitudes and technological adaptability, considering Alderfer's ERG Theory, Vroom's Expectancy Theory, and Lawler and Porter's Improved Expectancy Theory [45-47]. The factor loadings of three indicators of the motivation dependent variable in response to three different questions have been found to be 0.734, 0.606, 0.804, respectively.

The values of t, p-value and effect size (f^2) shown in Table 4 should also be considered to assess the statistical significance of the effect of that variable on each other in the proposed model. If t value is 1.96 or higher, the effect will be significant at 95% confidence level [12].The effect is significant if the p-value is less than 0.05. In addition, if the value of f^2 is greater than;

- 0.02, the effect will be small
- 0.15, the effect will be medium
- 0.35, the effect will be big [15].

Table 4. The results of the structural model analysis.

Hypothesis	t value	p value	f^2 value	Result	Impact
Hypothesis 1: Concentration has a positive effect on pilot motivation.	0.189	0.850	0.000	Not Supported	None
Hypothesis 2: Lifestyle activities have a positive effect on pilot motivation.	0.029	0.977	0.000	Not Supported	None
Hypothesis 3: Communication skills have a positive effect on pilot motivation.	3.396	0.001	0.050	Supported	Medium
Hypothesis 4: External triggers have a negative effect on pilot motivation.	0.326	0.745	0.000	Not Supported	None
Hypothesis 5: Stress has a negative effect on pilot motivation.	7.068	0.000	0.221	Supported	Big
Hypothesis 6: Leadership has a positive effect on pilot motivation.	1.078	0.281	0.008	Not Supported	None
Hypothesis 7: Job satisfaction has a positive effect on pilot motivation.	4.203	0.000	0.056	Supported	Medium
Hypothesis 8: Burnout has a negative effect on pilot motivation.	4.403	0.000	0.112	Supported	Medium

Table 5. Fornell-Larcker criterion assessment.

	Concentration	Lifestyle Activities	Communication	External Triggers	Stress	Leadership	Job Satisfaction	Burnout
Concentration	0.764							
Lifestyle Activities	0.023	0.795						
Communication	0.376	0.015	0.837					
External Triggers	0.417	0.143	0.659	0.696				
Stress	0.253	-0.068	0.423	0.475	0.752			
Leadership	0.385	0.280	0.396	0.374	0.191	0.732		
Job Satisfaction	0.398	0.113	0.470	0.589	0.398	0.322	0.737	
Burnout	-0.300	-0.373	-0.307	-0.394	-0.145	-0.457	-0.289	0.753

The Fornell-Larcker test was used to evaluate the accuracy of the measurement model's discriminant validity. According to the data given in Table 5, it can be observed that the square of the diagonal values is greater than the correlation between the row and column. The results of the test show that the proposed structural model has the could ability to discriminate validity.

4. CONCLUSION

The pilot has become a significant force multiplier because of advancements and innovations within the aviation industry. The performance of pilots is always expected to be of high performance, considering that even small mistakes might result in potentially fatal outcomes. Motivation has been recognized as a crucial component of a pilot's high performance. his study aimed to investigate the factors that influence pilot motivation. Expert opinion and a literature review have determined that eight independent variables influence the dependent variable of motivation. The variables under investigation in this study encompass concentration, lifestyle activities, communication, external triggers, stress, leadership, job satisfaction, and burnout. A total of 34 indicators were determined and subsequently applied to a sample of 256 pilots through an online survey. The collected data were analyzed using structural equation modeling in the SmartPLS program. Following the tests conducted to assess the model's validity and reliability, nine indicators were eliminated from the model and subsequently revised.

The R-squared value for the dependent variable of pilot motivation was found to be 0.594. In summary, job satisfaction, burnout, external triggers, communication, leadership, stress, attention, and critical activity factors account for 59.4% of the variation in pilot motivation. As the coefficient of determination exceeds 50%, it can be concluded that the power of explanation is medium. The independent latent variable that affected the motivation-dependent variable the most was stress. Therefore, investigating and addressing the stress on the pilot is a situation that cannot be ignored. Given the negative effect of stress management on pilot motivation, it is important for aviation institutions to conduct thorough investigations into the factors and come up with appropriate solutions that contribute to pilot stress. It is considered that stress may have an impact on motivation due to reasons such as high responsibility and security concerns, long and irregular working hours, challenging working conditions, difficulties in social and family life, performance pressure and evaluation, criminal sanctions, and disciplinary punishments.

As a suggestion for future work, the results of the current study can be compared with a study to be conducted with a sample taken from pilots working abroad. In particular, the effect of the stress factor, which is considered the biggest factor, can be examined in detail and the results obtained can be evaluated comparatively. This type of analysis can make important contributions to understanding how stress factors affect pilots under different working conditions. It may be interesting for researchers to investigate the importance of education in stress management. Pilots can measure their stress levels after receiving stress management training. This approach will provide an important method for evaluating the effectiveness of the training provided and determining whether pilots' stress coping skills have improved. The resulting data may also reveal the effects of stress management training on pilots' job performance and overall health. Additionally, the difference between the stress levels of pilots graduating from military or civilian universities may be examined to measure the variability in stress levels of pilots with different educational backgrounds. As a long-term study, it can be investigated how

pilots' motivation sources change at different stages of their careers. This type of research can provide important data on professional development and satisfaction by revealing how the factors affecting pilots' motivation evolve from the beginning of their careers to retirement.

The most significant deficiency in our research is the limited participant count. An additional limitation is that the number of indicators for independent variables falls below three. It is advisable to propose the implementation of a novel model that can high level account for the variability observed in pilot motivation. This can be achieved by augmenting independent latent variables and the number of indicators and reaching a large sample size.

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