International Journal of Business Integrity and Technology Advancements (IJBITA)

Volume – 02
Issue – 01
(2026)

Leveraging Entrepreneurial and Intrapreneurial Orientation to Achieve Operational Excellence in Aviation Organizations

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Article Info:
Received: 28 Dec, 2025
Processed: 20 Jan, 2026
Published: 28 Feb, 2026

Keywords:
Entrepreneurial orientation, Intrapreneurial orientation, Operational excellence, Aviation management, Organizational agility, PLS-SEM.

ABSTRACT

In the aviation industry, operating in a high velocity, safety critical and capital-intensive environment, aviation organizations are only competitive, safe and profitable when they are operating effectively: Operational Excellence (OE).

This research aims to explore the relationship between entrepreneurial orientation (EO) and intrapreneurial orientation (IO) to operational excellence in U. S. aviation firms, such as airlines, maintenance-repair-overhaul (MRO) companies, airport operators, and aviation logistics companies.

A cross-sectional survey design with a structured and validated questionnaire was used to collect data from 280 aviation managerial and operational level employees from U.S. aviation organizations. The data analysis was conducted by descriptive statistics, confirmatory factor analysis (CFA) and structural equation modeling (SEM) using partial least squares (PLS-SEM).

Results show that both EO and IO have a significant positive influence on operational excellence and the influence of IO is slightly stronger than that of EO because IO is an internal, process-based measure. Both of these relationships are partially mediated through organizational agility.

The results contribute to the theory of entrepreneurship beyond the context of aviation operations and provide practical recommendations for aviation business leaders who want to embed innovative and proactive actions while maintaining compliance to the regulations and aviation safety requirements.

INTRODUCTION

The aviation industry is currently undergoing a structural change in which the demand for air transport is recovering from the COVID-19 pandemic, fuel prices fluctuate, there is a shortage of manpower, sustainability requirements are being introduced, and digitalization is moving fast.In the aftermath of the COVID-19 pandemic, the aviation industry is in a state of transformation, shaped by the recovery of demand, volatility of fuel prices, manpower shortages, sustainability mandates, and fast digitalization [1] [2]. In the United States, low-cost carriers, changing passenger expectations, and strong enforcement by the Federal Aviation Administration (FAA) are driving greater competition for aviation organizations, especially. In this setting, operational excellence (sustained capacity to execute strategy more reliably, safely, and efficiently than competitors) is a key factor in influencing the survival of organizations [3].

The traditional operational excellence concepts (Lean, Six Sigma, Total Quality Management) highlight the need for standardization of processes and elimination of waste. But, more and more scholars have suggested that process discipline is not enough to achieve operational excellence in dynamic industries, as it is also necessary to implement entrepreneurial behaviors that allow organizations to make sense of change, take risks, and innovate proactively [4], [5]. Research on the entrepreneurial orientation (EO) of a firm, also known as the entrepreneurial characteristics of a business, has been widely conducted in the field, and is typically represented

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by three dimensions: innovativeness, proactiveness and risk taking [6]. Intrapreneurial orientation (IO) is a construct that is very similar to entrepreneurial orientation but refers to entrepreneurial activity that occurs inside an organization, in which employees are not only innovative, but also take risks and are supported by the organization, and mostly within certain constraints, called internal venturing, employee-driven innovation, or organizational support for employee entrepreneurship [7, 8].

Although EO and IO have each been shown to be associated with firm performance in manufacturing, technology and service industries [9, 10], the joint impact of EO and IO on operational excellence has not been studied closely in the aviation sector, an industry that is constrained by safety regulations and the requirement for innovation yet subject to tight regulation. This study focuses on elucidating these relationships from an empirical perspective by testing the relationship between EO, IO and operational excellence among U.S. aviation organizations and studying organizational agility as a mediating variable.

RESEARCH OBJECTIVES

1. To examine the effect of entrepreneurial orientation on operational excellence in U.S. aviation organizations.
2. To examine the effect of intrapreneurial orientation on operational excellence in U.S. aviation organizations.
3. To assess the mediating role of organizational agility in the EO–OE and IO–OE relationships.
4. To provide evidence-based recommendations for aviation executives seeking to institutionalize entrepreneurial and intrapreneurial behaviors.

RESEARCH QUESTIONS

RQ1: Does entrepreneurial orientation significantly predict operational excellence in aviation organizations?

RQ2: Does intrapreneurial orientation significantly predict operational excellence in aviation organizations?

RQ3: Does organizational agility mediate the relationship between EO/IO and operational excellence?

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

A. OPERATIONAL EXCELLENCE IN AVIATION

Operational excellence (OE) is a multi-dimensional concept that includes safety performance, on-time performance, cost-effectiveness, resource utilization and continuous improvement capability [3] [11]. In aviation, OE is even further limited because of the need to comply with regulations, the need for quick turnaround times, and the need for zero-defect performance in safety-related processes [12]. Recent studies highlight the growing reliance of aviation OE on the ability to integrate digital tools, predictive maintenance and data-driven decision making into traditional operational processes [13].

B. ENTREPRENEURIAL ORIENTATION

Entrepreneurial orientation is defined as an organization's strategic approach that has innovativeness, proactiveness, risk-taking and competitive aggressiveness and autonomy [6, 14]. Generally, more highly EO firms are better able to spot new opportunities, adapt to market disruption and quickly reallocate resources [9]. For the service and capital intensive sectors like aviation, EO has been linked with the use of new business models, route optimization as well as ancillary revenue innovation [15].

H1: Entrepreneurial orientation has a significant positive effect on operational excellence in U.S. aviation organizations.

C. INTRAPRENEURIAL ORIENTATION

Intrpreneurial orientation is a degree of an organization's attempt to foster entrepreneurial attitudes in its internal employees, encouraging them to identify inefficiencies, propose process innovations, and own operational improvements, within predetermined limits [7, 16]. IO is done at the individual and team level and is directly related to organizational culture, managerial support, and reward systems, whereas EO is generally done at the firm/strategic level [8]. In high-reliability organizations, research has shown that IO is useful in situations where the frontline workers have tacit knowledge of the operations that top-level management does not have and also the cyberattacks are a big challenge to handle [17].

H2: Intrapreneurial orientation has a significant positive effect on operational excellence in U.S. aviation organizations.

D. ORGANIZATIONAL AGILITY AS A MEDIATOR

An agile organization can be defined as the ability to sense environmental changes and reconfigure resources quickly [18] and is also posited to be an intermediate effect of both EO and IO and a precursor to operational performance [19]. Generally speaking, organizations are more likely to be either entrepreneurially or intrapreneurially oriented, to have agile structures, and to have measurable operational gains that are derived from entrepreneurial intent [20].

H3a: Organizational agility mediates the relationship between entrepreneurial orientation and operational excellence.

H3b: Organizational agility mediates the relationship between intrapreneurial orientation and operational excellence.

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E. CONCEPTUAL FRAMEWORK

The model proposed follows a similar structure to recent models used in transportation and logistics research [21] [22] where EO and IO are treated as exogenous constructs, agility is treated as a mediating construct, and operational excellence is treated as the endogenous outcome variable.

RESEARCH METHODOLOGY

A. RESEARCH DESIGN

The study used a quantitative, cross sectional and explanatory survey design as used in the previous studies on EO/IO performance [9] and [16]. Given the goal of testing hypothesized causal relationships between latent constructs measured using validated scales, the positivist paradigm was used.

B. POPULATION AND SAMPLING

The target population included all managerial, supervisory and senior operational staff in aviation organizations involved in commercial airline, maintenance-repair-overhaul (MRO) service, airport operations, and aviation ground-handling/logistics organizations in the United States. This population was chosen since it is likely that these roles will have visibility into both strategic decision making (which is relevant to EO) and frontline process innovation (which is relevant to IO).

Eligible respondents were approached using a non-probability purposive sampling technique with the assistance of snowball sampling using the LinkedIn social media platform, specifically by visiting aviation-related groups and industry associations. Data was collected over an eight week period with the use of an online, self-administered questionnaire through the use of Qualtrics.

A total of 412 questionnaires were sent out and 296 were returned (71.8%). Of the 280 responses that were retained for the analysis, 68.0% of these were usable, after discarding incomplete responses and failed attention-check items. The sample size of 280 exceeds the minimum size suggested for PLS-SEM models with this number of structural paths going to one construct, which is 10 times the largest number of paths [10] and which is applied here.The minimum size for this type of model, as per the largest number of structural paths directed to a single construct, is 10 times the number of paths, which is 10 in this case [10]. A sample size of 280 is exceeded, and is within the general rule of thumb of 10 respondents per observed construct, which is 28 in this case [23, 24].

C. MEASUREMENT INSTRUMENT

The questionnaire comprised of six sections: (1) informed consent and screening questions, (2) demographic items, (3) EO items, (4) IO items, (5) organizational agility items and (6) operational excellence items. All construct items were assessed on a 5-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree), modified from previously validated scales:

- Entrepreneurial Orientation (9 items): adapted from the Covin and Slevin EO scale as refined in recent aviation and transportation studies [6], [15].
- Intrapreneurial Orientation (8 items): adapted from validated internal corporate entrepreneurship scales [7], [16].
- Organizational Agility (6 items): adapted from sensing–responding agility scales used in logistics and service operations [18], [19].
- Operational Excellence (10 items): adapted from multidimensional OE scales covering safety, efficiency, quality, and continuous improvement, contextualized for aviation operations [3], [11].

D. PILOT STUDY AND INSTRUMENT VALIDATION

To test the clarity of the items and preliminary reliability, a pilot test was administered with 30 aviation professionals (not part of the final sample). Based on pilot feedback, minor wording revisions were made to three items. The internal consistency of the pilot (Cronbach alpha) ranged from 0.79 to 0.88, which is an acceptable level for the instruments before the full deployment.

E. DATA ANALYSIS TECHNIQUES

Data were analyzed in three stages using SPSS 29 and SmartPLS 4:

1. Descriptive and preliminary analysis — demographic profiling, normality assessment, common method bias testing (Harman's single-factor test), and missing-data diagnostics.
2. Measurement model assessment — confirmatory factor analysis (CFA) evaluating convergent validity (AVE), internal consistency reliability (Cronbach's alpha, composite reliability), and discriminant validity (Fornell-Larcker criterion and HTMT ratio).
3. Structural model assessment — PLS-SEM path analysis to test H1–H3b, including bootstrapping (5,000 resamples) for significance testing and mediation analysis.

F. ETHICAL CONSIDERATIONS

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Ethical procedures were adhered to in conducting the study with human subjects and an informed consent statement was presented to the participants before they could access the survey, explaining the purpose of the study, the fact that participation was voluntary and that there would be anonymity and confidentiality of the data. No personally identifiable information was gathered and organizational names were not included in the data set.

DATA ANALYSIS AND RESULTS

A. DEMOGRAPHIC PROFILE OF RESPONDENTS

Demographic Variable	Category	Frequency (n = 280)	Percentage
Gender	Male	168	60.0%
	Female	112	40.0%
Age	25–34 years	74	26.4%
	35–44 years	98	35.0%
	45–54 years	76	27.1%
	55+ years	32	11.5%
Organization Type	Commercial Airline	118	42.1%
	MRO Provider	62	22.1%
	Airport Operations Authority	54	19.3%
	Aviation Logistics/Ground Handling	46	16.5%
Job Level	Senior Management	41	14.6%
	Middle Management	116	41.4%
	Supervisory/Team Lead	123	44.0%
Years of Experience	Less than 5 years	38	13.6%
	5–10 years	96	34.3%
	11–15 years	84	30.0%
	Above 15 years	62	22.1%

B. COMMON METHOD BIAS AND NORMALITY

The Harman single factor test showed that the single factor explained 32.7% of the total variance, which was less than 50%, and this indicated that there was not a significant level of common method bias. All construct items were within normal limits of skewness (-0.41 to 0.38) and kurtosis (-0.52 to 0.61) and thus assumed to be approximately normally distributed for the SEM procedures.

C. MEASUREMENT MODEL ASSESSMENT

Table 1. Reliability and Convergent Validity

Construct	Items	Cronbach's α	CR	AVE
Entrepreneurial Orientation (EO)	9	0.887	0.906	0.583
Intrapreneurial Orientation (IO)	8	0.862	0.891	0.561
Organizational Agility (OA)	6	0.841	0.879	0.548
Operational Excellence (OE)	10	0.901	0.918	0.572

Table 1: Reliability and Convergent Validity

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All constructs exceeded the recommended thresholds of α ≥ 0.70, CR ≥ 0.70, and AVE ≥ 0.50 [24], confirming acceptable reliability and convergent validity.

Construct	EO	IO	OA	OE
EO	0.764			
IO	0.512	0.749		
OA	0.487	0.531	0.740	
OE	0.548	0.579	0.562	0.756

Table 2: Discriminant Validity (Fornell-Larcker Criterion)

Diagonal values represent the square root of AVE, which exceeded inter-construct correlations in all cases, confirming discriminant validity. HTMT ratios ranged from 0.61 to 0.71, remaining below the conservative 0.85 threshold.

STRUCTURAL MODEL AND HYPOTHESIS TESTING

Hypothesis	Path	β	t-value	p-value	Decision
H1	EO → OE	0.312	4.87	<0.001	Supported
H2	IO → OE	0.348	5.21	<0.001	Supported
H3a	EO → OA → OE	0.104	2.94	0.003	Partial mediation
H3b	IO → OA → OE	0.121	3.16	0.002	Partial mediation

Table 3: Path Coefficients and Hypothesis Testing Results

The model had medium to substantial explanatory power in both operational excellence ($R^2 = 0.463$) and organizational agility ($R^2 = 0.381$) in line with previous organizational behavior SEM studies [21]. The Stone-Geisser Q^2 values (EO – OE path = 0.291 and IO – OE path = 0.276) indicated satisfactory predictive power.

SUMMARY OF FINDINGS

As a result of the tests, both entrepreneurial orientation ($\beta = 0.312$, $p < 0.001$) and intrapreneurial orientation ($\beta = 0.348$, $p < 0.001$) were found to significantly and positively predict operational excellence, thereby supporting hypothesis H1 and H2. The direct effect of intrapreneurial orientation was marginally more significant than that of entrepreneurial orientation, implying that internal development of innovative ideas by employees is more likely to be a direct determinant of the day-to-day performance of the business than an entrepreneurial orientation at the firm level. Both were partially mediated by organizational agility, thus supporting H3a and H3b; EO and IO contribute to operational excellence in part by increasing sensing and response capabilities of the organizations.

DISCUSSION

The results reinforce the conclusion that while process standardization is important, there are related aspects of entrepreneurial and intrapreneurial behavior that are also important in aviation organizations striving for operational excellence in the United States. This is consistent with the evolving views on operational excellence, which view it as a "capability" and not a "compliance" result [4] and [13].

Its comparatively greater impact indicates that aviation companies might gain more operational value from enabling frontline and mid-level staff to spot and implement process changes rather than a top-down approach of strategic entrepreneurial efforts. This is in line with the principles of high-reliability organization theory, which focuses on the value of distributed expertise and employee proactiveness and vigilance in safety-critical environments [17]. Strategically, this means that the airlines, MROs and airport authorities have to invest in not just strategic innovation programs (e.g., new market entry, digital transformation programs, etc.) but also in structured intrapreneurship initiatives – internal idea incubators, suggestion programs linked to operational KPIs, and a psychologically safe environment for frontline innovation with regulatory boundaries.

The partial mediation role of organizational agility suggests that entrepreneurial intent alone is not enough, organizational structure and culture must also be agile to transform entrepreneurial actions into actions and results. This is consistent with the recommendations elsewhere in the literature that aviation organizations need to devolve some decision making authority and invest in a real-time data infrastructure that allows for swift sensing and response [18], [20].

THEORETICAL IMPLICATIONS

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This study is important to the field of entrepreneurship and operations management because it (1) empirically separates the effects of EO and IO in a single safety-critical industry context, (2) validates organizational agility as a mediator between entrepreneurial constructs and operational performance, and (3) extends EO/IO theory, traditionally applied in manufacturing and technology industries, to the aviation industry, where the nature of regulation is qualitatively different, thereby changing the relationship between entrepreneurial constructs and operational performance.

PRACTICAL IMPLICATIONS

Aviation executives should think about: (1) establishing intrapreneurship programs that reward process innovation at the front line of operations without compromising safety compliance; (2) incorporating entrepreneurial risk assessment into the strategic planning process to reconcile innovation and regulatory obligations; (3) investing in enablers of organizational agility, including cross-functional teams, real-time operational dashboards, and decentralized decision authority; and (4) using structured internal communication to uncover tacit operational knowledge at supervisory and team-lead levels, who make up 44% of this study's sample and are uniquely positioned at the nexus of strategy and execution.

LIMITATIONS AND FUTURE RESEARCH

There are some limitations in this study. In particular, the cross sectional design is not suitable for causal inference; the longitudinal design would better reflect the development and influence of EO and IO in terms of time. Second, purposive and snowball sampling, although feasible for reaching aviation professionals, reduces generalizability, compared to probability sampling. Third, there may be common method variance even though it was not found to be statistically significant because the data was collected from a single source and from a self-report. Further studies should include objective operational performance measures (e.g., FAA on-time performance records, safety incident rates) in addition to perceptual measures obtained from surveys and should explore boundary conditions (e.g., organizational size, regulations intensity, digital maturity) as potential moderators between the EO/IO– OE relation.

CONCLUSION

This research empirically proves that entrepreneurial orientation and intrapreneurial orientation both are significant and positive predictors of operational excellence in aviation organizations in the U.S. and organizational agility partially explains the relationship between entrepreneurial orientation and operational excellence, as well as the relationship between intrapreneurial orientation and operational excellence. The results indicate that aviation companies aiming at sustainable operational excellence need to go beyond the traditional process-improvement approaches, and develop entrepreneurial and intrapreneurial competencies at the strategic and operational levels. Institutionalizing mechanisms conducive to innovativeness, proactiveness and calculated risk-taking while maintaining the safety and compliance standards inherent in aviation can provide the organizational dynamic capabilities needed for future competition in a rapidly changing industry.

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