Entrepreneurship Capability by Triple Series Innovations in Building Competitive Resilience within the Airline Industry

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ABSTRACT

This research examines how entrepreneurship capability affects competitive resilience within the airline business, focusing on innovation sequences along the value chain as a solution to environmental turbulence. **The study aims** to investigate the mechanism through which entrepreneurship capability contributes to resilience by mediating organizational, digital, and business model innovations. **The study involved** 250 CEOs and top leaders in Indonesian airlines. Data were collected via surveys and analyzed using SPSS 25 and Smart Partial Least Squares (SmartPLS) 4. **Findings** show that entrepreneurship capability does not directly affect digital collaboration or business model innovation. Its effect occurs indirectly through organizational innovation, which promotes digital distribution innovation, leading to business model innovation. Together, these innovations strengthen resilience in turbulent environments. The study highlights the critical role of the triple serial relationship among organizational innovation, digital distribution, and business model innovation in navigating crises such as the COVID-19 pandemic. **Practically**, airline leaders should use entrepreneurship capability to drive innovation, support digital transformation, and adopt customer focused strategies to sustain competitiveness. This research contributes original insight by revealing how entrepreneurship capability indirectly fosters resilience through innovation sequences, aiding airlines in adapting to market changes. The study aligns with SDGs 8 (Decent Work and Economic Growth) by promoting entrepreneurship led growth and SDGs 9 (Industry, Innovation, and Infrastructure) through advancing innovative and resilient business practices.

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1. INTRODUCTION

This study examines airlines experiencing COVID-19 related challenges through the lens of Strategic Management process theory. Strategic management is a systematic method companies use to gain an edge and achieve superior returns. It links strategic actions and competitive strategy implementation, including strategic entrepreneurship [1]. Performance reflects firm goals such as achieving above average returns. Entrepreneurship is characterized by individuals who successfully lead the innovation process, bringing new products or services to market despite obstacles. Furthermore, Strategic Entrepreneurship involves the capability to act entrepreneurially by seeking and exploiting opportunities in the external environment through innovation [2]. Airline entrepreneurship aligns with company vision by managing resources to drive innovation, overcome challenges, and enhance competitiveness. It fosters resilience by enabling opportunity pursuit, business creation, and supply chain innovation. By connecting creativity and innovation, entrepreneurship plays a vital role in the success of airlines and the broader economy and society [3]. The process of pursuing opportunities to meet market needs without constraints from existing resources. Let us see in Figure 1.

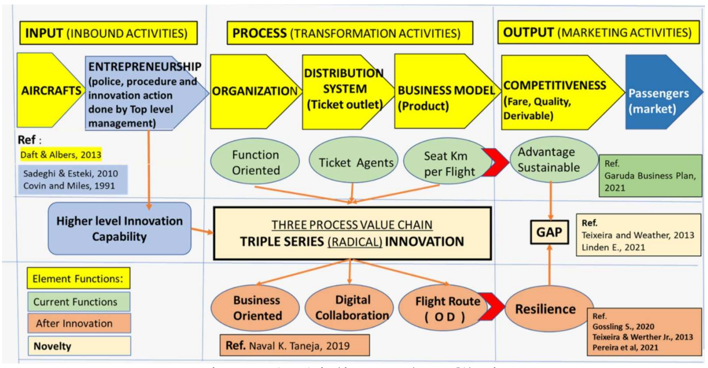

Figure 1. Airline Value Chain

This study examines how entrepreneurship and a three phase innovation approach contribute to airline resilience. Entrepreneurship must drive significant creative changes to withstand turbulence through this series of innovative business activities. Analyzing an airline's value chain helps reveal opportunities for change, boost competitiveness, and identify new market possibilities. The passage emphasizes how entrepreneurship and innovation drive economic growth. It also explains that the airline industry can overcome challenges like the COVID-19 pandemic by adopting creative and robust business strategies. Richard Cantillon first defined entrepreneurship as the creation of new businesses [1].

2. LITERATURE REVIEW

This study is limited to 250 respondents from 17 Indonesian airlines, focusing on senior managers and above with specific functional expertise to represent entrepreneurship. While the sample is sufficient for Smart PLS-SEM analysis with bootstrapping, it is not large enough to provide comprehensive insights into the international airline industry or reflect airlines as unique global entities [4]. The airline value chain includes inbound activities (aircraft and entrepreneurship), transformation activities (organization, distribution, and products), and market activities (competitiveness and customer satisfaction). Understanding this chain highlights opportunities to enhance competitiveness and explore new markets. This study focuses on the role of entrepreneurship and triple series innovation in building resilience, emphasizing the need for creative, radical changes to navigate industry challenges.

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3. RESEARCH METHOD

This explanatory quantitative study examines the relationship between entrepreneurial ability and organizational innovation in the Indonesian aviation industry using a cross sectional design [6]. The population comprises employees of AOC 121 airlines (Garuda Indonesia, Citilink) and AOC 135 carriers (Pelita Air Services, Lion Air Group, Air Asia, Trans Nusa, Sriwijaya Air) [7], with 670 individuals in middle–top management. Non-probability quota sampling targeted this group [8], requiring at least 150 respondents. A Google Form was distributed to 285 managers, and 150 were selected for analysis [9]. A six-point Likert scale (1–6) was used to reduce neutral responses, and all variable dimensions were carefully operationalized for precise measurement [10]. See Table 1.

Table 1. Variable and Dimension

Construct	Definition	Dimensions
Entrepreneur Capability	A firm's ability to identify, evaluate, and develop opportunities, as well as coordinate strategic actions and resources to pursue these opportunities.	1. Self-Efficacy 2. Industry Dynamic 3. Risk-Taking 4. Innovativeness
Organization Innovation	Organizational innovation refers to the adoption of a novel organizational approach within a company's business operations, workplace management, or external partnerships.	1. Process Orientation 2. Structure Flexibility 3. Level Decision 4. Relationship Orientation
Digital Collaboration Innovation	Industry 4.0 is driving faster, more efficient processes, producing a wider range of higher quality products at lower costs in digital marketplaces.	1. Access to Market 2. Collaboration 3. Innovativeness 4. Personalized Product
Business Model Innovation	The characteristics of the firm, along with the influence of entrepreneurship and economic factors, should contribute to improved business model innovation and have been impacted by the emergence of new business models and their associated performance.	1. Sharpening Freestyle 2. Renewal 3. Profit Oriented
Competitive Resilience	Competitive advantage in the marketplace is often driven by self-sufficiency and collaboration, both of which contribute to building competitive resilience.	1. Self-sufficient 2. Organization 3. Competitiveness 4. Strategic orientation

Once the data has been collected, it will be analyzed in three stages. First, descriptive analysis. Second, Research Model Analysis (Outer Model and Inner Model). Third, Structural Path Analysis (SEM). These three steps will be applied in this study [11]. Thus, the hypothesis development in this study is as follows:

This hypothesis by Direct Analysis:

- H1 Entrepreneurship Capability (EC) to Organization Innovation (OI)
- H2 Entrepreneurship Capability (EC) to Digital Collaboration Innovation (DCI)
- H3 Entrepreneurship Capability (EC) to Business Model Innovation (BMI)
- H4 Organization Innovation (OI) to Digital Collaboration Innovation (DCI)
- H5 Organization Innovation (OI) to Business Model Innovation (BMI)
- H6 Digital Collaboration Innovation (DCI) to Business Model Innovation (BMI)
- H7 Business Model Innovation (BMI) to Competitive Resilience (CR)

This hypothesis Indirect Analysis:

- H8 Entrepreneurship Capability (EC) to Competitive Resilience (CR) through OI, DCI, BMI
- H9 Entrepreneurship Capability (EC) to Competitive Resilience (CR) through OI, BMI
- H10 Entrepreneurship Capability (EC) to Competitive Resilience (CR) through BMI
- H11 Entrepreneurship Capability (EC) to Competitive Resilience (CR) through DCI, BMI

Based on the theoretical framework, hypothesis development, and variable operationalization and measurement, the model structure that has been designed as the final result is shown Figure 2 below:

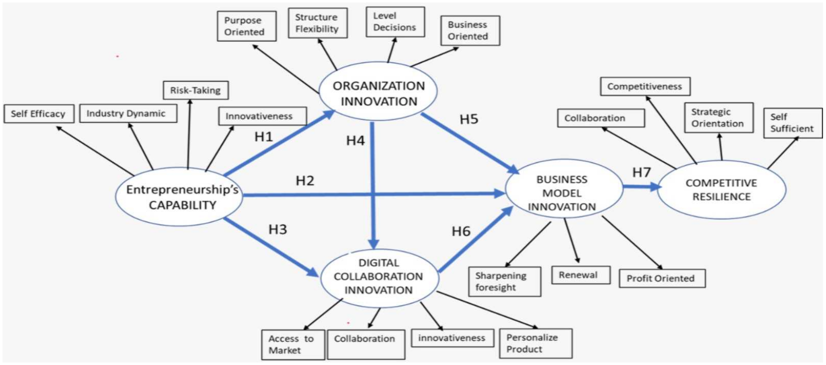

Figure 2. The Structural Model

Figure 2 illustrates the structural model that connects the study's core constructs, showing how EC acts as the initial driver that stimulates OI, which subsequently enables the development of DCI along the value chain. These two forms of innovation then contribute to strengthening Business Model Innovation, which ultimately serves as the key determinant in enhancing CR within the airline industry. The model highlights a sequential or triple series innovation pathway, indicating that EC does not directly create CR but operates through a chain of organizational, digital, and business model innovations that collectively build sustainable competitive strength.

4. RESULT AND DISCUSSION

This study uses mid-level managers in airline organizations as the unit of analysis, as they are considered to represent the entrepreneurial capabilities of the organization [12]. Mid-level managers have responsibilities across different aspects of the organization, as well as capabilities, experience and authority that allow them to provide relevant views. From the data collected on airlines in Indonesia, there were 659 middle and senior managers [13]. Questionnaires were sent to 250 respondents via Google Forms shared via WhatsApp and Email, but only 217 questionnaires were returned, equivalent to 86.8%.

4.1. Descriptive Data

Respondent profiles are categorized by gender, age, education, job title, service length, and number of subordinates [14], showing that males dominate the sample (89%), with 67% aged over 55 and 13% under 35. In terms of education, 44% hold a Bachelor degree, 40% a Master, and 5% a Doctorate, while 54% have worked for more than 20 years and 48% supervise over 40 subordinates additionally, 36% occupy top-level positions such as VPs and Directors, reflecting strong entrepreneurial capabilities and relevance to aviation related issues [15]. Descriptive statistics, including minimum, maximum, mean, and standard deviation, were analyzed using SmartPLS and Excel statistical software [16]. The questionnaire employed a five-point Likert scale, where one indicated “strongly disagree” and six indicated “strongly agree”, and the mean values across variables ranged from 4.65 to 5.52, with standard deviations between 0.38 and 0.71 [17].

4.2. Research Model Analysis (Outer Model and Inner Model)

The research model analysis comprises two main stages: evaluating the outer model and the inner model to ensure reliability, validity, and structural accuracy. The outer model assessment examines factor loadings, composite reliability, Cronbach's alpha, and AVE to confirm that each indicator accurately represents its latent construct, with low-loading indicators removed to improve precision. Once the measurement model is verified, the inner model analysis evaluates the structural relationships among latent variables using R-square values, path coefficients, and bootstrapping significance tests. This combined approach ensures that the model provides both reliable measurements and meaningful insights into the causal relationships under investigation.

4.2.1. Evaluation Outer Model

Following an assessment of validity using Factor Loadings (F/L), it was determined that several indicators fell below the established threshold of 0.60. Consequently, these indicators were excluded from further analysis [18]. This filtering process is a crucial step in the evaluation of the outer model, as indicators that do not meet the minimum loading criteria can introduce measurement noise and potentially bias the interpretation of the construct. By ensuring that only indicators with adequate loading values remain, the model becomes more precise in capturing the underlying latent variables. This practice is widely emphasized in measurement theory, where weak indicators are known to compromise convergent validity and reduce the overall explanatory capacity of the model.

The removal of these low-performing indicators also contributes to the refinement of the analytical framework, enabling subsequent stages of evaluation such as reliability testing and structural model assessment to yield more robust and interpretable results. In addition, excluding indicators with suboptimal loadings helps improve the internal consistency of the constructs, thereby enhancing the coherence between the theoretical foundations and empirical findings. Through this process, the resulting model is better positioned to generate reliable insights and support stronger conclusions within the research context. Table 2 provides a detailed listing of the eliminated indicators, including the corresponding factor loading values and the specific rationale for their exclusion based on established methodological guidelines.

Table 2. List of dropped indicators

Latent Variables	**Dimension**	**Indicators**	**Factor Loading > 0.60**
Entrepreneurship Capability	Risk Taking	EC-11 Q11	0.552
	Innovativeness	EC-13 Q13	0.487
		EC-14 Q14	0.496
		EC-17 Q17	0.564
Organization Innovation	Structure Flexibility	OI-5 Q22	0.597
	Level of Decision	OI-9 Q26	0.439
	Relationship Orientation	OI-16 Q33	0.381
		OI-17 Q34	0.293
Digital Collaboration Innovation (DCI)	Access to Market	DCI4 Q39	0.450
	Collaboration	DCI7 Q42	0.505
	Personalized Product	DCI16 Q50	0.322
Business Model Innovation	Renewal	BMI4 Q57	0.539
		BMI5 Q58	0.544
	Profit Orientation	BMI13 Q65	0.575
Competitive Resilience (CR)	Organization	CR7 Q72	0.574
	Competitiveness	CR11 Q76	0.554

After the elimination process, 65 valid indicators were retained from the initial 82 and used to recalculate the Revamp Model. This recalibration ensured that all remaining indicators met the criteria of validity and reliability, thereby strengthening the accuracy of construct measurement. The refinement process also minimizes the presence of measurement bias, as indicators with insufficient factor loadings may distort the interpretation of latent variables if not removed. With only well-performing indicators retained, the model becomes more theoretically coherent and empirically stable, contributing to clearer construct differentiation and stronger convergent validity across dimensions.

As illustrated in Figure 3, the updated model provides a more precise representation of the latent variables EC, IO, DCI, BMI, and CR while reducing measurement error [19, 20]. This enhanced model structure not only reinforces the internal consistency of each construct but also improves model fit, allowing for more accurate parameter estimation during the structural evaluation phase. Consequently, the refined indicator set contributes to a more robust analytical framework in which subsequent path coefficient calculations and hypothesis testing yield results that are both methodologically sound and substantively meaningful. Such improvements ultimately strengthen the validity of the study's conclusions and support a more comprehensive understanding of the relationships among the examined variables.

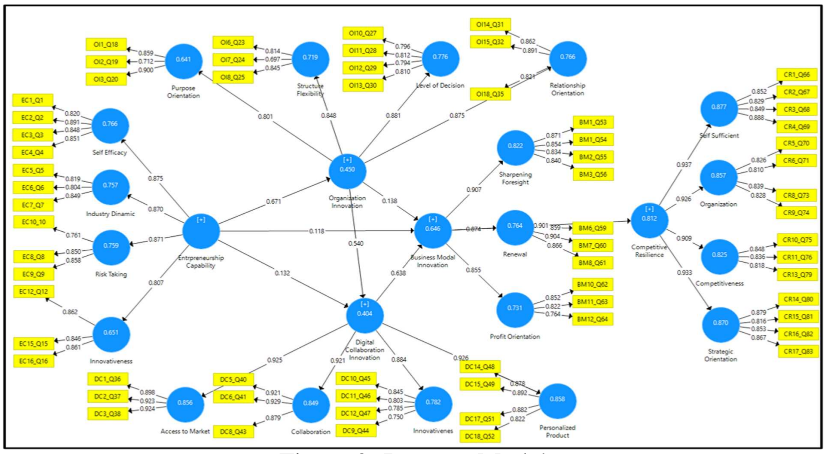

Figure 3. Revamp Model

After eliminating 17 indicators, the study now includes five variables, 19 dimensions, and 65 indicators (see Figure 3). We then reassessed the validity of the outer measurement model, as explained below [21]. Figure 3 presents the Revamp Model, showing the refined structure after eliminating 17 indicators and retaining 65 valid items across five latent variables and 19 dimensions. Large blue nodes represent the main constructs, smaller blue nodes depict their dimensions, and yellow squares indicate the final observed indicators. The paths and coefficients illustrate how the constructs are interconnected, particularly how EC contributes to OI, DCI, and BMI, which subsequently enhances CR. Overall, the figure provides a clear visualization of the improved measurement and structural model following the recalibration process.

4.3. Entrepreneurship Capability (EC)

Factor loading, Cronbach's alpha, composite reliability, and AVE validate entrepreneurship capability [22]. All indicators are above the 0.70 threshold, and Cronbach's alpha values exceed 0.50, indicating internal consistency. Composite reliability between 0.864 and 0.914 also confirms the stability of the measurement. Additionally, the AVE values for the latent variable and its dimensions are above 0.50, demonstrating convergent validity [23]. As shown in Table 3, the Fornell–Larcker criterion further confirms discriminant validity, indicating that the EC variable is empirically distinct from other constructs in the model.

Table 3. Variable Latent Validity Measurement Entrepreneurship Capability

Variable	Code	Factor Loadings	Validity (F.L $\geq$ 0.70)	Cronbach's Alpha $\geq$ 0.50	CR $\geq$ 0.70	AVE $\geq$ 0.50	Reliability
Entrepreneurship Capability	EC	-	-	0.921	0.933	0.517	Reliability
Self Efficacy	EC1_Q1	0.820	valid	0.875	0.914	0.727	Reliability
	EC2_Q2	0.891	valid				
	EC3_Q3	0.848	valid				
	EC4_Q4	0.851	valid				
Industry Dynamic	EC5_Q5	0.819	valid	0.765	0.864	0.679	Reliability
	EC6_Q6	0.804	valid				
Risk-Taking	EC7_Q7	0.849	valid	0.701	0.811	0.622	Reliability
	EC8_Q8	0.850	valid				
	EC9_Q9	0.858	valid				
	EC10_Q10	0.761	valid				
Innovativeness	EC12_Q12	0.862	valid	0.819	0.892	0.734	Reliability
	EC15_Q15	0.846	valid				
	EC16_Q16	0.861	valid				

The analysis of factor loading, Cronbach alpha, composite reliability, and AVE for entrepreneurship capability shows that all indicators exceed the 0.70 threshold, confirming their validity. Cronbach alpha values exceed 0.50, ensuring reliability, and composite reliability ranges from 0.864 to 0.914. The AVE values for the latent variable and its dimensions are above 0.50, confirming convergent validity [24]. Fornell-Larcker results show construct distinctions. Overall, entrepreneurship capability indicators, dimensions, and latent variables are valid and reliable, meeting outer model assessment criteria [25].

4.4. Organization Innovation (IO)

The factor loadings for the organizational innovation indicators are between 0.697 and 0.900, which are above the 0.70 threshold [26]. Cronbach's alpha and composite reliability both exceed the minimum thresholds $(AVE \geq 0.50$ and $CR \geq 0.70)$, confirming reliability. AVE values indicate convergent validity, and the Fornell–Larcker criterion confirms that the AVE values exceed the correlations with other constructs, demonstrating that each dimension of organizational innovation is empirically distinct. These results indicate that the measurement model for IO performs consistently across its indicators and is statistically robust. Furthermore, the strong reliability and validity measures reflect that the construct effectively captures the underlying characteristics of organizational innovation in this study. In addition, the coherence among these statistical indicators reinforces the model's ability to represent organizational innovation accurately, ensuring that subsequent structural analyses are built upon a solid and methodologically sound measurement foundation. Table 4 below demonstrates the validity and reliability of organizational innovation and its dimensions.

Table 4. Validity and Reliability of Organization Innovation

Variable	Code	Factor Loadings	Validity FL 0.70	Cronbach's Alpha 0.50	CR 0.70	AVE 0.50	Reliability
Organization Innovation	OI	-	-	0.912	0.926	0.532	Reliable
Purpose Orientation	OI1_Q18	0.859	valid	0.768	0.866	0.685	Reliable
	OI2_Q19	0.712	valid				
	OI3_Q20	0.900	valid				
Structure Flexibility	OI6_Q23	0.871	valid	0.695	0.830	0.621	Reliable
	OI7_Q24	0.697	valid				
	OI8_Q25	0.845	valid				
Level of Decision	OI10_Q27	0.796	valid	0.817	0.879	0.645	Reliable
	OI11_Q28	0.812	valid				
	OI12_Q29	0.795	valid				
	OI13_Q30	0.811	valid				
Reliationship Orientation	OI14_Q31	0.863	valid	0.821	0.894	0.737	Reliable
	OI15_Q32	0.891	valid				
	OI18_Q35	0.820	valid				

Furthermore, these results indicate that the indicators used successfully reflect the conceptual meaning of organizational innovation as perceived by the respondents. The relatively high factor loading values show that each item contributes significantly to explaining the construct and is therefore suitable for further analysis within the model. The satisfactory values of AVE, Cronbach's alpha, and composite reliability together suggest that the measurement model has strong internal consistency and convergent validity. As such, the organizational innovation construct is considered reliable and valid, and can be confidently included in the subsequent structural model analysis to examine its influence on the dependent variables in this study.

4.5. Digital Collaboration Innovation (DCI)

The outer model assessment indicates that the DCI variable satisfies all required criteria, with factor loadings ranging from 0.750 to 0.929 [27], confirming that each indicator strongly represents the latent construct. Cronbach's alpha and composite reliability also exceed the minimum thresholds, demonstrating high internal consistency and stable measurement of DCI. The Average Variance Extracted (AVE) further supports convergent validity, showing that the construct explains a substantial portion of indicator variance. Meanwhile, the Fornell–Larcker results confirm clear distinction between DCI and other variables [28, 29], indicating strong discriminant validity and ensuring the construct does not conceptually overlap with others. Overall, these validity outcomes strengthen the robustness of the measurement model and support more reliable interpretation of relationships within the research framework.

Table 5. Validity and Reliability of Digital Collaboration Innovation

Variable	Code	Factor Loadings	Validity FL ≥ 0.70	Cronbach's Alpha ≥ 0.50	CR ≥ 0.70	AVE ≥ 0.50
Digital Collaboration Innovation	DCI	-	-	0.954	0.960	0.631
	DCI1_Q36	0.898	valid			
	DCI2_Q37	0.923	valid			
Access to Market	DCI3_Q38	0.924	valid			
	DCI5_Q40	0.921	valid	0.903	0.939	0.838
Collaboration	DCI6_Q41	0.929	valid	0.896	0.935	0.828
	DCI8_Q43	0.879	valid			
	DCI9_Q44	0.750	valid			
Innovativeness	DCI10_Q45	0.845	valid	0.819	0.892	0.734
	DCI11_Q46	0.803	valid			
	DCI12_Q47	0.785	valid			
	DCI14_Q48	0.878	valid			
Personalized Product	DCI15_Q49	0.892	valid	0.892	0.925	0.755
	DCI17_Q51	0.882	valid			
	DCI18_Q52	0.822	valid			

Table 5 shows that all indicators of the DCI construct meet the required validity and reliability criteria. Every item has a factor loading above 0.70, while Cronbach's alpha, composite reliability, and AVE values all exceed the recommended thresholds. These results confirm that the DCI variable and its dimensions are consistently measured and statistically reliable for further analysis. Overall, the DCI variable, along with its dimensions and indicators, is valid and reliable. The table 5 presents the detailed results of factor loading, Cronbach's alpha, composite reliability, and AVE, while the next table shows the Fornell-Larcker results for discriminant validity [30]. These findings collectively affirm that the measurement model for the DCI construct is robust, statistically sound, and suitable for further hypothesis testing within the structural model.

4.6. Business Model Innovation (BMI)

The outer model assessment shows that the BMI variable and its dimensions meet all validity and reliability requirements. All indicators have factor loadings above 0.70, indicating strong construct relationships, while Cronbach's alpha values exceed 0.50 and composite reliability ranges from 0.854 to 0.926, surpassing the 0.70 threshold [31]. AVE values above 0.50 confirm convergent validity [32]. Overall, these results demonstrate that the BMI construct is internally consistent, empirically robust, and suitable for further structural analysis.

Table 6. Validity and Reliability of Business Model Innovation (BMI)

Variable	Code	Factor Loadings	Validity FL ≥ 0.70	Cronbach's Alpha ≥ 0.50	CR ≥ 0.70	AVE ≥ 0.50	Reliability
Business Model Innovation	BMI	-	-	0.911	0.926	0.558	Reliable
	BMI2_Q55	0.834	valid				
Sharpening Foresight	BMI1_Q53	0.871	valid	0.872	0.912	0.722	Reliable
	BMI1_Q54	0.854	valid				
	BMI2_Q55	0.834	valid				

Renewal	BMI3_Q56	0.840	valid	0.849	0.909	0.768	Reliable
	BMI6_Q59	0.859	valid				
	BMI7_Q60	0.904	valid				
	BMI8_Q61	0.866	valid				
Profit Orientation	BMI10_Q62	0.852	valid	0.744	0.854	0.662	Reliable
	BMI11_Q63	0.822	valid				
	BMI12_Q64	0.764	valid				

Table 6 demonstrates that all indicators of the Business Model Innovation (BMI) construct meet the required validity and reliability standards. The factor loadings for all items exceed the 0.70 threshold, confirming adequate convergent validity. Additionally, Cronbach's alpha, composite reliability (CR), and AVE values for each BMII dimension-Sharpening Foresight, Renewal, and Profit Orientation surpass the recommended minimum criteria, indicating strong internal consistency. These results verify that the Business Model Innovation construct is measured reliably and can be confidently used in the structural model analysis. The discriminant validity of BMI is further validated through the Fornell-Larcker criterion, which ensures that each construct is distinct from the others in the model. The detailed outcomes of the validity and reliability assessments are presented in the subsequent table, followed by analysis results in Table 6.

4.7. Competitive Resilience (CR)

Statistical analysis shows that all indicators have factor loadings between 0.810 and 0.889, exceeding the required threshold. Cronbach's alpha for dimensions and latent variables ranges from 0.782 to 0.957, meeting or surpassing the 0.50 criterion, and composite reliability is above 0.70. Thus, the CR variable and its components demonstrate valid and reliable measurement [33, 34]. Convergent validity was tested through the AVE (Average Variance Extracted) value, which exceeded 0.50, confirming the convergent validity of the variable. Discriminant validity was assessed by comparing the square root of the AVE with the correlation between constructs [35]. The Fornell-Larcker results are displayed in Table 7 below:

Table 7. Validity and Reliability of Competitive Resilience (CR)

Variable	**Code**	**Factor Loadings**	**Validity (FL ≥ 0.70)**	**Cronbach Alpha ≥ 0.50**	**CR ≥ 0.70**	**AVE ≥ 0.50**	**Reliability**
Competitive Resilience	CR	-	-	0.952	0.957	0.616	Reliable
Self Sufficient	CR1_Q66	0.852	valid	0.877	0.916	0.731	Reliable
	CR2_Q67	0.829	valid				
	CR3_Q68	0.849	valid				
	CR4_Q69	0.869	valid				
Organization	CR5_Q70	0.826	valid	0.845	0.896	0.682	Reliable
	CR6_Q71	0.810	valid				
	CR8_Q73	0.840	valid				
	CR9_Q74	0.828	valid				
Competitiveness	CR10_Q75	0.889	valid	0.782	0.873	0.696	Reliable
	CR11_Q76	0.836	valid				
	CR13_Q79	0.862	valid				
Strategic Orientation	CR14_Q80	0.878	valid	0.876	0.915	0.729	Reliable
	CR15_Q81	0.816	valid				
	CR16_Q82	0.853	valid				
	CR17_Q83	0.866	valid				

Table 7 confirms that all indicators of the CR construct meet the required standards of validity and reliability. Each item shows factor loadings above 0.70, indicating strong convergent validity across the four dimensions: Self-Sufficient, Organization, Competitiveness, and Strategic Orientation. The Cronbach's alpha, composite reliability (CR), and AVE values for all dimensions exceed the recommended thresholds, demonstrating high internal consistency and adequate variance explained by the indicators. These results show that the Competitive Resilience construct is statistically reliable and suitable for use in the subsequent structural model analysis.

4.7.1. Inner Model Analysis: Goodness-fit and Path Coefficient The Coefficient of Determinant: R-Square

Table 8 shows that the R^2 value for the competitiveness variable is 0.825, which means that 82.5% of the variance in Competitiveness can be explained by EC, OI, DCI, and BMI, while the remaining 17.5% is influenced by factors outside the research model [36]. An R^2 value of this magnitude falls into the strong category, indicating that the regression model used has a high explanatory power and a good level of data fit, thus confirming that the selected independent variables provide a robust framework for understanding competitiveness. This finding underlines that the independent constructs incorporated into the model are not only statistically significant but also practically meaningful in shaping competitive outcomes [37, 38].

Table 8. R-Square Value

Variable	**RSquare**	**Percentage (%)**	**Interpretation**
Competitive Resilience	0.825	82%	Strong
Organization Innovation	0.450	45%	Moderate
Digital Collaboration Innovation	0.404	40%	Moderate
Business Model Innovation	0.646	64%	Moderate

The result also highlights the central role of entrepreneurial capacity, organizational innovation, business model transformation, and digital collaboration as strategic levers that jointly shape competitiveness in a dynamic business environment. Each of these dimensions interacts systematically, creating synergistic effects that reinforce the company's ability to adapt, respond to external pressures, and capture new opportunities in rapidly changing markets. In this regard, the explanatory strength of the model implies that competitiveness is not the outcome of a single isolated factor but rather the culmination of integrated efforts across multiple domains of organizational capability [39, 40]. Furthermore, the high R^2 value demonstrates that the model is not only statistically robust but also theoretically consistent, reinforcing prior findings in strategic management and innovation studies that competitiveness is strongly influenced by internal organizational dynamics [41]. By capturing 82.5% of the variance, the model offers empirical validation that the chosen variables EC, OI, DCI, and BMI constitute a comprehensive framework for analyzing competitiveness. This provides a strong foundation for managerial implications, as it directs decision makers toward areas of capability development that yield the greatest impact on competitive advantage [42, 43].

In addition, the fact that only 17.5% of the variance is explained by factors outside the model suggests that while external environmental elements such as regulatory frameworks, macroeconomic conditions, or industry-specific disruptions may play a role, the internal capabilities outlined in this study remain the dominant predictors of competitiveness [44, 45]. This reinforces the importance of strategically cultivating and aligning entrepreneurial and innovative capabilities within organizations as the primary levers of sustainable competitive positioning. Taken together, these results suggest that firms that simultaneously strengthen entrepreneurial capability, foster continuous organizational innovation, embrace digital collaboration, and pursue adaptive business model transformation are more likely to achieve sustainable competitive advantage [46]. The integration of these strategic dimensions positions organizations to remain resilient in the face of uncertainty, responsive to technological change, and proactive in leveraging emerging opportunities, thereby ensuring long-term competitiveness in volatile and complex markets [47, 48].

4.8. Significance of the Path Coefficient Analysis: Bootstrapping

The significance of the path coefficients was assessed using the Smart PLS-SEM bootstrapping procedure, which generates repeated subsamples to evaluate the stability of parameter estimates without assuming normality. Through this process, t-statistics and p-values are produced to determine whether relationships between latent variables are significant, with t-values above 1.96 and p-values below 0.05 indicating meaningful effects. Bootstrapping ensures that the model's relationships are robust and not the result of sampling error, thereby strengthening the empirical basis for confirming or rejecting the hypotheses and enhancing the credibility of the structural model evaluation.

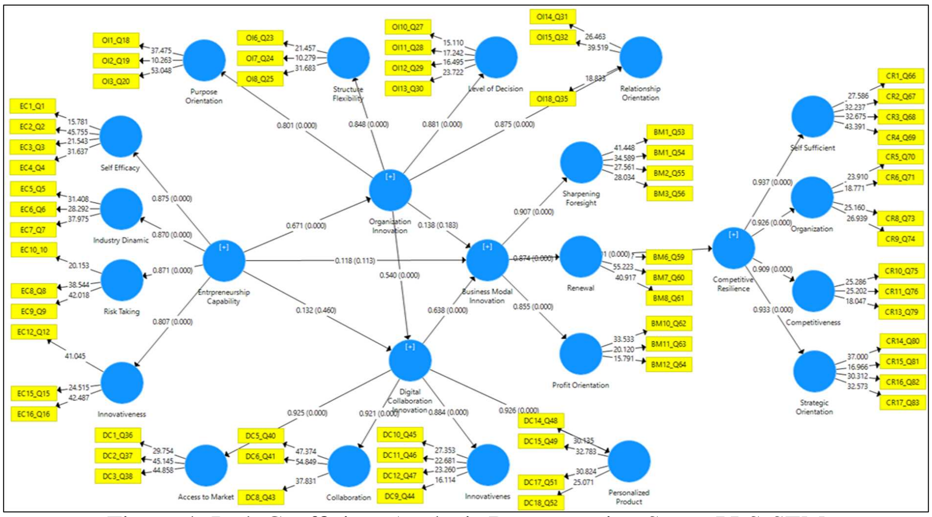

Figure 4. Path Coefficient Analysis Bootstrapping Smart PLS-SEM

Inner model analysis helps predict cause-and-effect relationships between latent variables abstract concepts like innovation capability, competitiveness, or resilience measured by multiple indicators, making it valuable for explaining complex theoretical frameworks. The relationship between two latent variables can be assessed using p-value and t-test calculations via bootstrapping in Smart PLS-SEM. Bootstrapping increases hypothesis testing reliability by resampling the original data to estimate parameter accuracy and standard errors, without requiring strict distributional assumptions. Figure 3 Inner Model output shows that the path coefficient, ranging from -1 to +1, indicates the strength and direction of relationships: values near +1 signal a strong positive link, near -1 a strong negative one, and values close to 0 show little or no relationship. The p-value tests hypothesis validity; a value below 0.05 signals statistical significance, while the t-statistic measures the strength of the path coefficients. If the t-statistic exceeds 1.96 and the p-value is below 0.05, the independent variable significantly affects the dependent variable. Meeting both conditions confirms strong explanatory power for the model and supports the validity of causal relationships in the research. This evaluation ensures that the structural relationships are not only statistically significant but also theoretically meaningful, thereby strengthening confidence in the interpretation of the research findings.

Table 9. Result Hypothesis Analysis

		Dirrect Effect			
	Hypothesis	**Path Coefficients**	**T-Statistic**	**P-Values**	**Conclusion**
H1	Entrepreneurship Capability → Organization Innovation	0.671	12.757	0.000	**Significant**
H2	Entrepreneurship Capability → Digital Collaboration Innovation	0.132	0.740	0.460	Not Significant
H3	Entrepreneurship Capability → Business Modal Innovation	0.118	1.587	0.113	Not Significant

H4	Organization Innovation → Digital Collaboration Innovation	0.540	3.852	0.000	**Significant**
H5	Organization Innovation → Business Model Innovation	0.138	1.334	0.183	Not Significant
H6	Digital Collaboration Innovation → Business Modal Innovation	0.638	4.783	0.000	**Significant**
H7	Business Model Innovation → Competitive Resilience	0.901	39.682	0.000	**Significant**
	Indirrect Effect				
H8	Entrepreneurship Capability → Organization Innovation → Digital Collaboration Innovation → Business Model Innovation → Competitive Resilience	0.208	3.455	0.001	**Significant**
H9	Entrepreneurship Capability → Organization Innovation→ Business Model Innovation → Competitive Resilience	0.083	1.353	0.177	Not Significant
H10	Entrepreneurship Capability → Business Model Innovation → Competitive Resilience	0.106	1.610	0.108	Not Significant
H11	Entrepreneurship Capability → Digital Collaboration Innovation → Business Model Innovation → Competitive Resilience	0.076	0.726	0.468	Not Significant

Based on the results listed in Table 9, this study can conclude that CE plays a role in driving innovation through three types of innovation, namely IO, DCI, and BMI, which in turn can increase CR. Of the seven hypotheses proposed in this study, four were found to be valid, namely H1, H4, H6, and H7. In particular, the indirect impact seen in hypothesis H8 suggests that entrepreneurial capability can improve competitive resilience through the innovation continuum. However, the statistical analysis does not sufficiently support the direct effects of hypotheses H2, H3, and H5, indicating that the direct relationship between these variables is not confirmed in this study. Similarly, hypotheses H9, H10, and H11 that test for indirect effects also did not receive sufficient evidence to be accepted. A more in-depth explanation of these results will be discussed further in the next chapter.

5. DISCUSSION

This study examines the influence of EC on multiple forms of innovation and their subsequent impact on CR. The results show that EC significantly drives OI (H1), supported by a strong path coefficient of 0.671 and a T-statistic of 12.757, making it the only direct effect of EC that is statistically significant. The effects of EC on DCI (H2) and BMI (H3) are not supported, though self-efficacy emerges as a key EC component for enabling innovation, especially in digital transformation. OI is found to positively influence DCI (H4) with a path coefficient of 0.540 and a T-statistic of 3.852, while its effect on BMI (H5) is rejected. DCI significantly affects BMI (H6), with a path coefficient of 0.638, indicating that digital collaboration enhances BMI and strengthens CR. EC indirectly contributes to CR through the sequential pathway involving OI, DCI, and BMI (H8), whereas its direct effects on CR via OI and BMI (H9) or via DCI and BMI (H10) are not significant. Overall, the findings highlight EC's central role in initiating innovation but suggest that additional elements are required to translate capability into sustained competitive resilience in dynamic market environments.

6. MANAGERIAL IMPLICATIONS

The findings of this study provide several important managerial implications for airline leaders and policymakers. First, the strong role of EC in driving OI suggests that managers should prioritize developing leadership competencies such as self-efficacy, risk taking, and adaptability. These attributes enable organizations to respond effectively to turbulence and uncertainty. Second, the significance of DCI and BMI highlights the need for managers to invest in digital infrastructure and collaborative platforms that can enhance operational efficiency, foster strategic partnerships, and support customer oriented solutions. By embracing these innovations, managers can redesign business models that are more agile, resilient, and aligned with dynamic market demands.

Third, the indirect effect of EC on CR through IO, DCI, and BMI underscores the importance of sequential innovation strategies. Managers should not expect immediate transformation from EC alone, but rather recognize the necessity of nurturing organizational innovation as the foundation for subsequent digital initiatives and business model renewal. This implies that leadership in the airline industry must adopt a long-term strategic orientation, ensuring that innovations are systematically implemented to sustain resilience. Overall, the results guide decision makers in prioritizing investments, aligning innovation strategies with organizational goals, and building adaptive capacity to achieve sustainable competitiveness in volatile environments.

7. CONCLUSION

In summary EC directly influences OI, but does not have a significant direct effect on DCI or BMI. This indicates that EC cannot directly drive DCI and BMI unless the organization has the appropriate readiness in digital business orientation. Second, OI has a direct effect on DCI, enabling organizations to progress to the next stage in the value chain through digital collaboration, but the direct effect of OI on BMI is not significant. This means that OI requires more mature readiness in digital distribution before it can affect the business model. Third, DCI has a significant influence on BMI, allowing digital collaboration to contribute to new product development and competitiveness. The most significant correlation is between BMI and CR, where an innovative business model can increase competitive resilience in the market. Fourth, the indirect effect of EC on CR through OI, DCI, and BMI is accepted, suggesting that entrepreneurship capability through continuous innovation such as Triple Series Innovation can build the CR of aviation companies. In other, this path of influence is effective only if it follows the order of value chain innovation: from EC to OI, OI to DCI, DCI to BMI, and finally BMI to CR.

Overall, the research framework demonstrates that Triple Series Innovation in entrepreneurship has a significant influence in building CR for airline companies. The research findings contribute both theoretically and practically. In theory, this research addresses a gap in existing literature by demonstrating how incremental Triple series innovations across value Chain OI, DCI, and BMI contribute to building CR within uncertain environments, thereby advancing entrepreneurship theory. Practically, the research provides insights into the aviation industry on the importance of digital innovation readiness and collaboration in creating a competitive business model in a highly regulated digital era. It also strengthens the understanding of organizational transformation towards a more innovative and digitally based business orientation, while highlighting the importance of digital collaboration in the distribution and development of new, more adaptive products.

However, the study has limitations, such as the scope being limited to airlines in Indonesia with a sample confined to senior managers, which does not provide an international perspective. Differences in respondents backgrounds also lead to variations in understanding. Additionally, the focus on CR without involving financial performance provides a less comprehensive view. Low response rates to the online questionnaire were attributed to cyber security concerns. Suggestions for future research could broaden its scope by including international airlines, investigating additional digital technologies such as big data and AI, analyzing the impact of entrepreneurship capability on financial performance, and utilizing qualitative methods to gain further insights into how entrepreneurship orientation affects performance improvement.

8. DECLARATIONS

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Conceptualization: SW and SS; Methodology: RR; Software: SS; Validation: SW; Formal Analysis: RR, SW, and SS; Investigation: RR; Resources: SW; Data Curation: RR; Writing Original Draft Preparation: SS and SW; Writing Review and Editing: RR, SS, and SW; Visualization: RR; All authors, SS, SW and RR have read and agreed to the published version of the manuscript.

8.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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