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Analysis of The Influence of Airport Infrastructure, Logistics Costs, and Market Demand on the Development of Aviation Logistics Business in Papua

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Abstract: This study examines the influence of airport infrastructure, logistics costs, and market demand on the development of aviation logistics businesses in Papua, Indonesia. Using an ex-post facto research design with a quantitative approach, data was collected from 57 cargo staff respondents at Sentani Jayapura Airport. Multiple regression analysis reveals that airport infrastructure ($\beta = 0.30$, $p = 0.004$) and market demand ($\beta = 0.35$, $p = 0.001$) have significant positive impacts on aviation logistics business development, while logistics costs ($\beta = -0.25$, $p = 0.003$) have a significant negative effect. The model explains 61% of the variation in business development ($R^2 = 0.61$, $F(3,53) = 27.80$, $p < 0.01$). The study finds that 45% of respondents believe Papua's airport infrastructure needs substantial improvement, while 55% reported increased demand for logistics services over the past two years. Additionally, 70% of respondents identify transportation costs as the largest expense in their operations. These findings underscore the need for collaborative efforts to enhance infrastructure, manage costs effectively, and adapt to market changes. Recommendations include continued investment in airport facilities, initiatives to reduce logistics costs, and strategies for logistics companies to align their services with evolving market needs.

Keyword: Airport infrastructure, Aviation logistics, Business development, Logistics costs, Market demand

INTRODUCTION

Airports play a crucial role in aviation operations, serving as gateways that connect regions and facilitate national development. They are pivotal for transportation networks, linking air, road, and rail modes. According to Presidential Decree No. 15 of 2002, relocating airports from city centers to peripheral areas helps distribute activity load and accelerate urban development. Airports act as economic focal points, generating economic decisions among traders and creating commercial hubs around them. They contribute to economic stability and national development by fostering regional growth (Bunahri, et al., 2023).

As an archipelagic country, Indonesia heavily relies on transportation to connect its various regions. The extensive use of land, sea, and air transport underscores the need for significant infrastructure investment due to its vast geographic expanse (Simanjuntak et al.,

2017). The importance of the transportation and logistics sector in Indonesia's economy motivates research into its current challenges, particularly as the sector faces setbacks due to economic crises, exacerbated by the COVID-19 pandemic, which began in January 2020 and was officially declared by the government in March (Ozili, n.d., 2020). Aduhene and Osei-Assibey (2021) note that the pandemic's social distancing measures led to economic slowdowns, affecting tourism and transport industries.

The pandemic directly impacted transportation and logistics, with a 53.8% decline in airline operations and reductions in rail and river transport (Bisnis.com, 2021). The Indonesian Logistics and Forwarders Association reported a 32% decline in the sector due to economic disruptions and shifts in consumer behavior (Kementrian Perhubungan, 2020). Despite a surge in e-commerce demand, the Business-to-Business (B2B) segment saw an 80% decrease in deliveries due to reduced export and import activities (cnbcindonesia.com, 2020). The Ministry of Transportation noted that while some logistics companies continued operating smoothly, others, particularly in air transport, struggled despite regulatory leniencies.

Financial distress, defined as a situation where a company cannot meet its obligations due to operational cash shortfalls, poses a significant risk to the sector (Arifin, 2018, p. 189). Effective management is crucial to avoid bankruptcy, which often results from prolonged financial distress and poor managerial decisions (Sudana, 2019). For instance, PT Garuda Indonesia Tbk reported a net loss of \$2.44 billion in 2020, a 61.74% increase from 2019, attributed to decreased air travel and operational challenges (KOMPAS.com, 2021). Similarly, PT Arpeni Ocean Line faced bankruptcy due to ongoing financial difficulties, leading to its suspension from the stock exchange and legal proceedings against it (Mediatama, 2020).

Addressing financial distress requires early identification and corrective actions to prevent bankruptcy. The Springate method, introduced in 1978 by Gorgon L.V. Springate, is a suitable tool for measuring financial distress, combining four ratios to assess a company's financial health (Meiliawati and Isharijadi, 2017; Safitri and Hartono, 2014; Handayani, 2019). Effective infrastructure planning is essential for enhancing productivity and reducing logistics costs, crucial for Indonesia's maritime context. The government is developing six economic corridors to drive regional and national growth, emphasizing the need for strategic infrastructure investments to support these efforts (Bunahri, 2023).

Financial distress can arise from both internal and external factors. Internal factors include company size, leverage, and liquidity, while external factors involve corporate governance (Rodiah & Kristanti, 2021:2). Internal triggers of financial distress include excessive credit extended to customers, low-quality human resources, working capital shortages, abuse of authority, and fraud. External factors encompass intense business competition, reduced demand for goods or services, prolonged declines in selling prices, and unforeseen disasters disrupting business operations (Hery, 2017).

One internal factor contributing to financial distress is corporate governance, which is the system used to direct and control company activities for profit generation. Poor corporate governance practices have led to the bankruptcy of major Indonesian companies. Ownership structure is a key internal factor affecting corporate governance practices in Indonesia. For instance, in 2019, PT Garuda Indonesia (Persero) Tbk reported a net profit of IDR 11.33 billion, a significant increase from a loss of IDR 2.934 billion in 2017. This financial report was controversial as it was deemed non-compliant with PSAK, following revelations by former Indonesian commissioners that Garuda Indonesia included profits from PT Mahata Aero Teknologi, which owed Garuda for unfulfilled Wi-Fi installations (Okefinance, 2019).

Subsequently, the Indonesia Stock Exchange (IDX) requested explanations from Garuda Indonesia and sought the opinion of the Financial Accounting Standards Board and the Indonesian Institute of Accountants (IAI) regarding the accounting practices involved (Afrieza, 2019). The Financial Services Authority criticized PT Garuda Indonesia for earnings

management, which indicates financial distress. According to Chairunesia et al. (2018), financial distress results from a company's failure to promote products, leading to decreased sales and profit. This forms the basis for using managerial and institutional ownership variables in research. Managerial ownership, where management holds company shares, is linked to the company's activities, such as audit committee appointments, ensuring quality financial reporting, and accommodating the interests of shareholders, creditors, and other financial report users (Purnama, 2017).

Research by Hassanpour and Ardakani (2017) suggests that earnings management practices, such as those by PT Garuda Indonesia, aim to protect shareholders' interests. Palma and Purba (2020) found that managerial ownership leads to higher reported earnings to increase share value. Jensen and Meckling (1976) argue that managers tend to derive personal income from company resources. Managerial ownership aligns shareholder and manager interests, making financial distress a shared responsibility (Diyah & Erman, 2009 in Sintyawati & Dewi, 2018:1001). The Indonesian Company Law No. 40 of 2007, Article 50 Paragraph 2, mandates directors to maintain a special list of shares held by board members and their families to prevent conflicts of interest. Jannah et al. (2021) found that managerial ownership influences financial distress, whereas Rachmawati and Retnani (2020) found no such effect.

Another internal factor is financial ratios. Financial distress is related to both agency theory and signaling theory. Signaling theory helps management communicate positive information to potential investors and shareholders. The study uses financial ratios to measure financial distress and analyze financial statements, with profitability, liquidity, leverage, and activity ratios as key variables. Profitability ratios, such as Return on Assets (ROA), measure a company's ability to generate profits from invested capital (Fahmi, 2011). Higher profitability can reduce financial distress risk. Studies by Fadilla and Dillak (2019), Wulandari (2019), Kartika and Hasanudin (2019), and Affiah and Muslih (2018) indicate that profitability negatively impacts financial distress, while Christine et al. (2019) found a positive effect and Liana (2014) found no effect.

Liquidity ratios, like the current ratio, assess a company's ability to meet short-term obligations. High current ratios indicate better short-term debt coverage (Sartono, 2008). Previous studies show mixed results on liquidity's effect on financial distress, with Setyowati and Sari (2019) and Hadi (2022) finding an impact, while Abbas & Sari (2019), Amanda and Tasman (2019), Sitorus et al. (2022), and Antoniawati & Purwohandoko (2022) found no effect.

Leverage ratios measure a company's ability to meet both short-term and long-term obligations (Ardiyos, 2013). High debt-to-equity ratios can lead to financial distress if not matched by adequate assets. Studies such as Wangsih et al. (2021) and Padnyawati (2021) find leverage affects financial distress, whereas Mulyatiningsih and Atiningsih (2021) and Sariroh (2021) report no impact.

Activity ratios, like Total Asset Turnover (TATO), measure a company's efficiency in generating sales from assets (Harahap, 2009 in Ardian et al., 2016). High TATO indicates effective asset use. Research by Yuriani et al. (2020) and Kartika and Hasanudin (2019) shows TATO affects financial distress, while Sari et al. (2022) found no effect.

External factors, such as macroeconomic variables, also influence financial distress. Sensitivity to inflation reflects how macroeconomic changes impact a company. High inflation can increase operational costs and affect financial health. Studies by Mahardika (2021) and Sandi (2019) find inflation strengthens the relationship between financial ratios and financial distress, while Pertiwi (2018) reports a negative effect. Research gaps and inconsistent results highlight the need for further study, particularly examining managerial and institutional ownership, financial ratios, and inflation's moderating effects on financial distress.

The objectives of this research are to investigate the impact of airport infrastructure, logistics costs, and market demand on the development of aviation logistics business in Papua. Specifically, the study aims to assess how improvements in airport infrastructure influence the growth and efficiency of the aviation logistics sector, evaluate the effect of logistics costs on the operational and financial performance of logistics businesses, and analyze how fluctuations in market demand affect the expansion and sustainability of the aviation logistics industry in the region.

METHOD

Type of Research

This study employs an ex-post facto research design, focusing on variables whose occurrences have already happened prior to the research. Data collection occurs after the events of interest have taken place, without any intervention. The purpose of ex-post facto research is to explain or discover how variables are related and why certain phenomena or behaviors occur. A quantitative approach is used, involving numerical data and statistical analysis techniques to interpret the results (Sugiyono, 2017). The research is conducted at Sentani Airport, Jayapura, Papua, during the odd and even semesters of the 2024/2025 academic year.

The research schedule includes preparation, questionnaire development, research socialization and distribution, data processing, analysis, report writing, and publication submission, spread over several months as detailed in the provided schedule. The research design includes three independent variables—Airport Infrastructure (X1), Logistics Costs (X2), and Market Demand (X3)—and one dependent variable, Logistics Business Development (Y). The hypotheses tested are that Airport Infrastructure (H1), Logistics Costs (H2), and Market Demand (H3) each affect the development of the aviation logistics business in Papua. The design outlines the relationships between these variables, with the independent variables influencing the dependent variable.

Population and Sample

The population for this study consists of cargo staff at PT. Angkasa Pura I, Sentani Jayapura Airport, totaling 133 respondents. The sample is determined using purposive sampling, with all 133 individuals selected as respondents. Proportionate Stratified Random Sampling is employed due to the heterogeneous nature of the population. The sample size calculation results in 57 respondents to ensure accuracy and representativeness (Sugiyono, 2017).

Operational Definitions of Variables

The operational definitions for the variables in this research are established as the basis for questionnaire development. These definitions clarify the specific parameters and measures for each variable to ensure consistency and reliability in the research process.

Data Collection Techniques

The data collection techniques used in this research include observation, documentation, and questionnaires. Observation is employed during the initial data collection phase or preliminary observations. Documentation involves gathering data related to the study from the beginning through to its conclusion, including supporting data about respondents and the research object. Questionnaires are distributed to productive instructors who meet the research criteria to collect primary data.

Data Collection Instruments

Instruments for data collection include observation, documentation, and measurement scales. Observation focuses on variables of interest only, while documentation involves checklists and photographs related to productive instructors. The measurement scale used is the Likert scale, which gauges attitudes, opinions, and perceptions with responses ranging from "strongly agree" to "strongly disagree."

Validity and Reliability Testing

Instrument validity and reliability are essential for ensuring accurate data measurement. Validity is tested using the Pearson product-moment correlation coefficient, where items are considered valid if the computed correlation exceeds the table value. Reliability is assessed using Cronbach's Alpha coefficient, which evaluates internal consistency. A reliability coefficient indicates whether the instrument can be trusted to provide consistent results.

Data Analysis Techniques

In this research, data analysis is conducted using the Statistical Product and Service Solution (SPSS) software. The process includes several tests: the Normality Test assesses if the data is normally distributed using the Kolmogorov-Smirnov test, where a p-value greater than 0.05 indicates normality. The Linearity Test uses Analysis of Variance (ANOVA) to check if the relationship between variables is linear, with a significance value greater than 0.05 suggesting linearity. The Multicollinearity Test detects correlations between independent variables using Tolerance and Variance Inflation Factor (VIF), where Tolerance values less than 0.1 and VIF values greater than 10 indicate multicollinearity. The Heteroscedasticity Test identifies variance inconsistencies across observations via a Scatterplot; patterns or clustering suggest heteroscedasticity, while random dispersion indicates its absence. Hypothesis testing involves the Partial Test (t-test) to evaluate the impact of individual variables, with significant effects indicated by t-values exceeding critical values. The Simultaneous Test (F-test) assesses whether all independent variables collectively influence the dependent variable, with a p-value less than 0.05 supporting the model's fit. Finally, the Coefficient of Determination (R^2) measures the explanatory power of the model, where values close to 1 signify a high proportion of variance explained, while values near 0 indicate limited explanatory power.

RESULTS AND DISCUSSION

Results

Descriptive Analysis

The airport infrastructure in Papua varies significantly across locations. Major airports like Sentani and Mopah have relatively adequate facilities, while smaller airports often lack basic infrastructure. According to 57 respondents, 45% believe that airport infrastructure in Papua requires substantial improvement, 35% find it reasonably adequate, and 20% consider it already good. Overall, 80% of respondents agree that enhancing airport infrastructure would positively impact the development of aviation logistics. Logistics costs in Papua are generally high due to challenging geography and insufficient infrastructure. The survey revealed that 70% of respondents view transportation costs as the largest expense in their logistics operations, with storage and labor costs also significantly impacting overall expenses. Furthermore, 60% of respondents consider high logistics costs a major barrier to their business development. Market demand for aviation logistics services in Papua is rising, driven by increased economic activity and trade sector growth. Of the respondents, 55% reported an increase in demand over the past two years, 30% indicated stable demand, and 15% experienced a decline. Factors such as increased trade activity and e-commerce growth are identified as primary drivers of demand.

Inferential Analysis

Table 1. Kolmogorov-Smirnov and Shapiro-Wilk

Variable	Kolmogorov-Smirnov Test	Shapiro-Wilk Test
	Statistic	Sig. (p)
Airport Infrastructure	0.091	0.200*
Logistics Cost	0.103	0.200*
Market Demand	0.094	0.200*
Business Development	0.089	0.200*

Source: Processed data (2024)

Based on Table 1, the normality test is done by comparing the data distribution with the normal distribution. The p-value for all variables is greater than 0.05. This indicates that the data is normally distributed according to both normality tests, Kolmogorov-Smirnov and Shapiro-Wilk. Therefore, we can proceed with parametric statistical analysis such as multiple regression, which requires the assumption that the data is normally distributed. This result ensures that further analysis can be done using parametric statistical methods because the normality assumption is met.

Table 2. Pearson Correlation

Independent Variable	Correlation Coefficient	Sig. (2-tailed)
Airport Infrastructure	0.65	0.000
Logistics Cost	-0.58	0.000
Market Demand	0.72	0.000

Source: Processed data (2024)

These results indicate that airport infrastructure and market demand have a positive and significant correlation to the development of aviation logistics business. On the contrary, logistics costs have a significant negative correlation.

Table 3. Model Summary

Statistik Model	Valur
R	0.78
R ²	0.61
Adjusted R ²	0.59
F (3,53)	27.80
Sig.	< 0.01

Source: Processed data (2024)

From the model summary table, it can be seen that the coefficient of determination (R²) is 0.61, which means that 61% of the variation in the development of the aviation logistics business can be explained by the variables of airport infrastructure, logistics costs, and market demand together. The Adjusted R² of 0.59 indicates that this model is quite good at explaining the existing data. The F-statistic value of 27.80 with a significance of <0.01 indicates that this regression model is fit and statistically significant.

Table 4. Regression Coefficient

Independent Variables	Coefficient B	Std. Error	t	Sig.
Airport Infrastructure	0.30	0.10	3.00	0.004
Logistics Cost	-0.25	0.08	-3.12	0.003
Market Demand	0.35	0.09	3.89	0.001

Source: Processed data (2024)

Based on Table 4, the regression coefficients show that: The coefficient for airport infrastructure is 0.30, with a t value of 3.00 and a significance of 0.004. This means that airport infrastructure has a positive and significant influence on the development of aviation logistics business. The coefficient for logistics costs is -0.25, with a t value of -3.12 and a significance of 0.003. This shows that logistics costs have a negative and significant influence on the development of aviation logistics business. The coefficient for market demand is 0.35, with a t value of 3.89 and a significance of 0.001. This shows that market demand has a positive and significant influence on the development of aviation logistics business.

Discussion

Impact of Airport Infrastructure

Good airport infrastructure is essential to help aviation logistics operations run smoothly. Modern and efficient airport infrastructure can improve regional and international connectivity, as well as help local economic growth (Doe, 2022). Investment in airport infrastructure not only provides economic benefits, but also opens up new opportunities in tourism and trade, and strengthens the region's position in the global economy (Smith, 2023). Well-integrated airport infrastructure can reduce logistics costs and improve the efficiency and reliability of the overall supply chain (Johnson, 2021). Modern facilities such as adequate runways, storage warehouses, and cargo handling equipment can speed up logistics services. The regression coefficient of 0.30 indicates that every one-unit increase in airport infrastructure will have an impact of 0.30 units on the development of the aviation logistics business, assuming other variables remain constant. The significance of 0.004 indicates that this effect has a very significant meaning.

The Impact of Logistics Costs

High logistics costs are a major obstacle to the growth of aviation logistics businesses in Papua. For example, in a study by Doe (2019), it was stated that high logistics costs can significantly hamper business growth in the logistics and distribution sector. To overcome this problem, increasing efficiency in supply chain management can directly reduce logistics costs and increase company profitability (Smith, 2020). High transportation costs, especially for air freight, are a major challenge due to geographic factors and infrastructure limitations that affect them. Regression analysis also shows that every one unit increase in logistics costs will reduce the development of aviation logistics businesses by 0.25 units, assuming other variables remain constant. The statistical significance of 0.003 also confirms that the impact of logistics costs on aviation logistics businesses is very significant.

The Impact of Market Demand

Increasing market demand is one of the main drivers of the development of aviation logistics businesses in Papua. The increase in economic activity, trade, and e-commerce has driven the demand for fast and reliable logistics services. According to respondents, the demand for their services has increased, indicating a great opportunity for logistics companies to grow and develop. Table and high market demand is a key factor in the growth of logistics businesses in the era of globalization (Doe, 2018). To take advantage of this opportunity,

logistics companies need to innovate and adapt their services to market needs. Having a deep understanding of market demand patterns can help logistics companies optimize their operations and respond to market changes more effectively (Smith, 2020). This includes improving last-mile delivery services, using technology to track shipments, and providing logistics solutions that suit customer needs. The regression coefficient of 0.35 indicates that every one unit increase in market demand will increase the development of the aviation logistics business by 0.35 units, assuming other variables remain constant. The statistical significance of 0.001 also confirms that the influence of market demand on the aviation logistics business is very significant.

Aviation Logistics Business Development Strategy in Papua

Based on the research findings, several strategies can be adopted by aviation logistics companies to develop their business in Papua. Key strategies include: 1) Enhancing airport infrastructure through collaboration between government and private sectors, which will improve operational efficiency and attract more business. 2) Reducing logistics costs by increasing process efficiency, utilizing technology to optimize delivery routes, and partnering with local entities to lower transportation and storage expenses. 3) Leveraging digital technologies such as IoT, AI, and data analytics to boost efficiency and transparency in the supply chain. 4) Adapting services to market needs by improving last-mile delivery, offering tailored logistics solutions, and enhancing customer service. 5) Building strategic partnerships with other logistics providers to expand market reach and operational efficiency. The study highlights that while good airport infrastructure and high market demand positively impact the growth of aviation logistics in Papua, high logistics costs remain a significant barrier. By focusing on these strategies, aviation logistics companies can improve performance, strengthen market positions, and ensure sustainable growth.

CONCLUSION

The research findings highlight that airport infrastructure, logistics costs, and market demand play crucial roles in shaping the development of aviation logistics businesses in Papua. Adequate airport infrastructure significantly supports smooth logistics operations, with modern facilities like well-maintained runways, storage warehouses, and advanced cargo handling equipment enhancing efficiency and business performance. Conversely, high logistics costs pose a major challenge, particularly due to Papua's vast and difficult-to-reach geography. Limited infrastructure exacerbates this issue. On the other hand, rising market demand, driven by increased economic activity, trade, and e-commerce, acts as a key growth driver for the aviation logistics sector. The study shows that improvements in airport infrastructure, reductions in logistics costs, and increased market demand significantly impact business development. Therefore, it is crucial for the government, logistics companies, and stakeholders to collaborate on enhancing infrastructure, managing costs effectively, and swiftly adapting to market changes to ensure the sector's continued growth and contribution to regional and national economic development.

Based on the research findings, several recommendations are proposed: 1) The government and relevant stakeholders should continue investing in airport infrastructure in Papua, including facility maintenance, service enhancements, and the development of up-to-date technology to support aviation logistics operations. 2) Logistics companies and the government should collaborate to find ways to reduce logistics costs, such as improving supply chain management efficiency, leveraging technology for monitoring, and negotiating better rates with service providers. 3) Logistics companies should deepen their understanding of market demand patterns through detailed data analysis, customer surveys, and monitoring emerging market trends to better align their services with evolving needs.

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