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# Strategic Analysis of Aviation Vocational Education Development Using the Ansoff Matrix: A Qualitative Case Study of Politeknik Penerbangan Surabaya

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**ABSTRACT**

Aviation vocational education institutions must continuously adjust their programs, partnerships, and service portfolios to technological change and evolving industry competence requirements. This study analyzes the strategic development options of Politeknik Penerbangan Surabaya using the Ansoff Matrix. A qualitative case-study design was employed. Data were obtained through semi-structured interviews with purposively selected internal and external stakeholders, direct observation of academic and training activities, and analysis of institutional strategic plans, performance reports, accreditation records, and cooperation documents. The data were analyzed through thematic coding and subsequently mapped to the four Ansoff strategies: market penetration, market development, product development, and diversification. Triangulation and member checking were used to enhance credibility. The findings indicate that product development and market development offer the strongest medium-term combination of feasibility and strategic impact. Priority initiatives include upgrading selected study programs, developing short courses in unmanned aircraft systems, airport operations, rescue and firefighting, and aviation cybersecurity, modernizing laboratories and simulators, and expanding cooperation with aviation organizations in Southeast Asia and the Middle East. Diversification through applied research centers, a digital academy, startup incubation, and professional consulting offers long-term value but requires stronger governance, specialist staff, and sustainable financing. The study is novel in adapting the product-market logic of the Ansoff Matrix to an aviation vocational education context and in proposing a staged institutional growth portfolio. Practically, the findings provide institutional leaders with a risk-sensitive roadmap for strengthening graduate relevance, international reach, innovation capacity, and institutional competitiveness.

**Keywords:** Ansoff Matrix; aviation education; institutional competitiveness; strategic management; vocational education

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## INTRODUCTION

Aviation is being reshaped by digital systems, automation, cybersecurity requirements, sustainability pressures, and increasingly complex safety standards. These changes affect not only airlines and airport operators but also the institutions responsible for preparing aviation professionals. Vocational education is expected to provide practice-oriented competence, industry-recognized certification, and the adaptability required for continuously changing occupations. Consequently, aviation vocational institutions must align curriculum, facilities, staff capability, partnerships, and organizational strategy with emerging industry needs.

Higher education institutions operate in an environment characterized by competition for students, industry partners, reputation, and resources. Strategic clarity is therefore necessary to determine which programs should be strengthened, which markets should be entered, and which new services should be developed. Pucciarelli and Kaplan (2016) argue that higher education competitiveness increasingly depends on institutions' ability to manage complexity, differentiate their offerings, and respond to uncertain stakeholder expectations. In parallel, digital transformation requires more than technology acquisition because it also involves organizational capabilities, governance, staff competence, and changes in learning and service models (Benavides et al., 2020; Alenezi, 2021).

These pressures are particularly significant for vocational institutions because their legitimacy is closely connected to graduate employability and industry relevance. International TVET policy emphasizes flexible pathways, digital and green skills, lifelong learning, industry engagement, and inclusive access (UNESCO, 2022). For an aviation vocational institution, this means that strategic development must simultaneously protect safety and regulatory compliance, maintain high-cost laboratories and simulators, anticipate new competence requirements, and build national and international networks.

Politeknik Penerbangan Surabaya is a public aviation vocational education institution under the Indonesian Ministry of Transportation. The institution provides education and training related to aviation engineering and operations and is expected to produce graduates who are technically competent and responsive to industry development. The original institutional analysis identified several possible initiatives, including upgrading selected programs from Diploma 3 to Diploma 4, developing training in unmanned aircraft systems, aerobridge operation, aircraft rescue and firefighting, and aviation data cybersecurity, strengthening simulator and laboratory facilities, expanding international cooperation, and establishing research, innovation, digital training, startup incubation, consulting, and certification services.

The Ansoff Matrix offers a structured way to classify these growth choices through four

product-market combinations: market penetration, market development, product development, and diversification (Ansoff, 1957). Although the model originated in corporate strategy, its underlying logic can be adapted to education. In this study, "products" refer to study programs, short courses, certifications, research, and professional services, while "markets" refer to current or new groups of learners, employers, institutional partners, and geographic regions. The model is useful because it makes strategic risk visible: strengthening existing offerings for existing stakeholders is generally less risky than simultaneously creating new services and entering new markets.

Existing scholarship has discussed competition, digital transformation, and strategic adaptation in higher education, but relatively little empirical work has operationalized the Ansoff Matrix for a specialized public aviation vocational institution. Previous discussions often remain at the level of general university competitiveness or technology adoption and do not explain how a vocational institution should sequence program innovation, market expansion, and diversification under regulatory, financial, and capability constraints. This leaves a practical and theoretical gap regarding how product-market growth logic can be translated into a staged portfolio for aviation vocational education.

This study addresses that gap by analyzing the development options of Politeknik Penerbangan Surabaya through a qualitative case study and the Ansoff Matrix. The study asks: (1) how can the institution's development initiatives be categorized within the four Ansoff strategies; (2) which strategies offer the most appropriate balance of impact, feasibility, and risk; and (3) what organizational conditions are required for implementation? The study contributes theoretically by adapting Ansoff's product-market framework to vocational education and practically by providing a staged roadmap for institutional leaders and policymakers.

## METHODOLOGY

### Research Design and Case Context

This study used a descriptive qualitative case-study design to examine strategic development within its organizational and industry context. A case-study approach was appropriate because the research focused on how multiple internal and external stakeholders interpreted institutional opportunities, constraints, and priorities at Politeknik Penerbangan Surabaya (Creswell & Poth, 2018; Yin, 2018). The unit of analysis was the institution's development strategy, while the embedded analytical categories were the four quadrants of the Ansoff Matrix.

### Participants and Sampling

Participants were selected through purposive sampling. The inclusion criteria were direct involvement in institutional planning, curriculum development, academic or training operations, industry cooperation, graduate recruitment, professional certification, or aviation training partnerships. Individuals without direct knowledge of institutional development decisions or aviation workforce requirements were excluded. Recruitment continued until the study obtained sufficiently varied perspectives across internal and external stakeholder groups.

## Data Collection

Three data sources were combined. First, semi-structured interviews explored institutional strengths, market opportunities, program relevance, implementation barriers, resource requirements, and perceived strategic risks. Second, direct observations focused on academic activities, laboratories, simulators, vocational training, and the interaction between educational provision and practice-based learning. Third, document analysis covered institutional strategic plans, performance reports, accreditation records, annual reports, and cooperation agreements. Combining these sources allowed claims made in interviews to be compared with observed practices and documentary evidence.

## Operationalization of the Ansoff Matrix

The Ansoff Matrix was operationalized by treating existing and new educational offerings as the product dimension and existing and new stakeholder or geographic segments as the market dimension. This adaptation enabled institutional initiatives to be compared systematically rather than presented as an unranked list of recommendations.

***Table 1***. Operationalization of the Ansoff Matrix for aviation vocational education.

| Strategy | Product/Service Position | Market Position | Institutional Interpretation | Indicative Risk |
|---|---|---|---|---|
| Market penetration | Existing | Existing | Strengthen current programs, service quality, certification, promotion, and stakeholder satisfaction | Lower |
| Market development | Existing | New | Offer established education or training to new industry sectors, regions, or international partners | Moderate |
| Product development | New or substantially upgraded | Existing | Develop new study programs, short courses, certifications, laboratories, and digital learning for current stakeholder groups | Moderate |
| Diversification | New | New | Create research, consulting, startup, digital academy, and professional service portfolios for new user groups | Higher |

### Data Analysis

Data analysis combined inductive thematic analysis with deductive mapping to the Ansoff Matrix. The procedure followed six stages: familiarization with interview, observation, and document data; initial coding; development of candidate themes; review of themes across data sources; definition and naming of themes; and production of an integrated interpretation (Braun & Clarke, 2006). Codes concerning programs, markets, partnerships, infrastructure, digitalization, research, revenue, human resources, and implementation risk were first generated. The resulting themes were then mapped to the four Ansoff quadrants. A cross-quadrant comparison considered strategic impact, resource requirements, organizational readiness, implementation time, and risk.

### Trustworthiness and Ethical Considerations

Credibility was strengthened through source triangulation among internal stakeholders, external partners, observations, and institutional documents. Method triangulation compared interview findings with direct observation and documentary evidence. Member checking was used to confirm the accuracy of interview summaries and the interpretation of strategic themes. An audit trail documented coding decisions and the movement from raw evidence to Ansoff categories. Dependability was supported through consistent use of the interview protocol and coding framework, while transferability was addressed by providing a clear description of the institutional context and strategic options.

## RESULTS

### Overview of Strategic Themes

The analysis identified initiatives in all four Ansoff quadrants. However, the evidence did not support treating all strategies as equally urgent or equally feasible. Product development and market development offered the strongest medium-term combination of relevance, feasibility, and institutional impact. Market penetration remained necessary as the foundation for quality and reputation, whereas diversification offered significant long-term value but carried the highest demands for governance, specialist capability, finance, and market validation.

**Table 2.** Strategic themes, supporting evidence, benefits, risks, and priorities.

| Ansoff Strategy | Key Themes | Existing Evidence Base | Expected Benefits | Main Risks/Challenges | Priority |
|---|---|---|---|---|---|
| Market penetration | Quality improvement; competency certification; institutional promotion; academic services | Interviews with internal stakeholders; observations of academic services; accreditation and performance documents | Stronger domestic reputation, applicant interest, and employer confidence | Incremental improvement may not respond rapidly enough to emerging occupations | Foundation / short term |


| Ansoff Strategy | Key Themes | Existing Evidence Base | Expected Benefits | Main Risks/Challenges | Priority |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Market development | New industry partners; Southeast Asian and Middle Eastern cooperation; staff and student exchange; international training marketing | Cooperation documents; stakeholder interviews; existing external networks | Wider recruitment and partnership base; international recognition; graduate mobility | Regulatory differences, language capability, partnership maintenance, and international quality assurance | High / medium term |
| Product development | Diploma 4 upgrading; SPUKTA, aerobridge, ARFF, and aviation cybersecurity training; simulator and laboratory modernization | Curriculum and accreditation documents; observations of facilities; interviews on industry competence needs | Improved curriculum relevance, graduate competence, and training demand | High capital cost, instructor certification, approval processes, and technology obsolescence | Very high / medium term |
| Diversification | Applied aviation research; smart airport and green aviation centers; digital academy; startup incubator; consulting and certification | Strategic-planning documents and stakeholder proposals | Innovation ecosystem, new revenue, industry contribution, and institutional differentiation | Highest financial and organizational risk; unclear demand; specialist staffing and governance needs | Selective / long term |

### Market Penetration: Consolidating the Existing Institutional Position

Market penetration focused on strengthening the institution's position within the existing national aviation vocational education market. The main themes were improvement of teaching and academic services, expansion of industry-recognized certification, stronger publication and promotion, and systematic engagement with employers and alumni. These actions were viewed as necessary for maintaining stakeholder confidence and increasing the attractiveness of existing programs. The strategy carries relatively low risk because it uses established programs and stakeholder relationships, but its impact depends on measurable improvements in graduate quality and service performance rather than promotional activity alone.

### Market Development: Extending Existing Programs to New Markets

Market development involved offering existing programs, training, and institutional expertise to new geographic and organizational segments. The analysis highlighted cooperation with aviation organizations in Southeast Asia and the Middle East, exchange programs for lecturers and students, international short courses, and stronger links with emerging aviation employers. This strategy can broaden institutional recognition and reduce dependence on a single domestic market. Its feasibility is supported by the institution's existing aviation specialization, although success requires language capability, international quality assurance, regulatory alignment, and sustained relationship management.

### Product Development: Updating the Educational and Training Portfolio

Product development emerged as the most immediately relevant strategic option. Proposed initiatives included upgrading selected Diploma 3 programs to Diploma 4, creating training in small unmanned aircraft systems, aerobridge operation, aircraft rescue and firefighting, and aviation data cybersecurity, and modernizing laboratories and simulators. These initiatives respond to changes in aviation technology and occupational competence while using the institution's existing learner base, regulatory experience, faculty structure, and industry relationships. The strategy nevertheless requires curriculum approval, certified instructors, investment planning, technology lifecycle management, and evidence of labor-market demand.

### Diversification: Building New Institutional Roles and Revenue Sources

Diversification extended beyond the institution's conventional teaching role. Proposed initiatives included an Applied Aviation Research and Innovation Center, a Smart Airport and Green Aviation Innovation Center, an Aviation Digital Academy, an aviation technology startup incubator, and consulting and safety-certification services. These initiatives may differentiate the institution, strengthen knowledge transfer, and generate new revenue. However, they represent new services for new user groups and therefore involve the greatest uncertainty. Implementation should be selective and preceded by demand validation, partnership design, financial feasibility analysis, risk assessment, and clear governance arrangements.

### Strategic Prioritization and Sequencing

The four strategies are complementary but should be sequenced. Market penetration provides the quality foundation, product development strengthens relevance for current stakeholders, market development expands the reach of proven offerings, and diversification should follow when capabilities and demand have been validated. The resulting portfolio is therefore not a choice of one quadrant over all others, but a staged pathway that balances growth with institutional readiness.

**Table 3.** Proposed sequencing of institutional development strategies.

| Phase | Strategic Emphasis | Illustrative Actions | Decision Gate |
|---|---|---|---|
| Short term (1–2 years) | Market penetration and preparation for product development | Quality assurance, certification, employer feedback, curriculum review, faculty development, facility audit | Evidence of service improvement, approved business cases, and staff readiness |
| Medium term (2–4 years) | Product development and market development | D4 upgrading, new short courses, simulator modernization, international partnerships and exchanges | Program approval, demand, partner commitment, financial sustainability, and graduate outcomes |


| Phase | Strategic Emphasis | Illustrative Actions | Decision Gate |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Long term (4+ years) | Selective diversification | Research and innovation centers, digital academy, incubation, consulting, and certification | Validated demand, governance model, specialist staff, risk controls, and sustainable funding |

## DISCUSSION

The findings show that the Ansoff Matrix can be adapted from a commercial growth tool into an educational portfolio framework. In this adaptation, educational programs and professional services function as products, while learners, employers, partners, and geographic regions constitute markets. This interpretation extends the model beyond enrollment growth and places curriculum, research, certification, partnerships, and professional services within a single strategic logic.

Product development emerged as a dominant strategy because it responds directly to the changing competence requirements of the aviation sector while drawing on capabilities already present within the institution. Upgrading qualifications, introducing targeted short courses, and modernizing simulators can strengthen relevance without requiring the institution to enter a completely unfamiliar field. This finding is consistent with research emphasizing that institutional competitiveness in higher education depends on differentiated offerings and the capacity to respond to stakeholder needs (Pucciarelli & Kaplan, 2016). It also reflects the broader TVET requirement to update qualifications in response to digital, technological, and green transitions (UNESCO, 2022).

Market development was also prioritized because international and cross-industry partnerships can expand the value of existing expertise. The institution already possesses a specialized aviation identity, making geographic and organizational expansion less risky than unrelated diversification. However, internationalization should not be treated as promotional activity alone. It requires compatible standards, staff mobility, language support, mutual recognition, quality assurance, and long-term partner governance.

The importance of digital learning, aviation cybersecurity, smart airport applications, and data-oriented training supports the argument that digital transformation is an organizational rather than purely technological process. Reviews of higher education digital transformation show that successful change depends on strategy, culture, leadership, people, processes, and infrastructure (Benavides et al., 2020; Alenezi, 2021). Therefore, purchasing new simulators or establishing a digital academy will not create strategic value unless accompanied by instructor development, curriculum redesign, data governance, maintenance capacity, and performance measurement.

Diversification offers the greatest opportunity for institutional differentiation but also the highest risk. Research centers, consulting, certification, and startup incubation can create an innovation ecosystem linking education, research, and industry. Ecosystem leadership requires

the ability to coordinate partners, mobilize resources, and adapt institutional capabilities over time (Foss et al., 2023). Without these capabilities, diversification may fragment resources or produce units with weak demand and unclear accountability. This explains why diversification should be selective and phased rather than implemented as a broad collection of new centers.

The study also reveals an important distinction between strategic attractiveness and implementation feasibility. Product development may be attractive because of industry demand, yet implementation can be constrained by regulatory approval, qualified instructors, capital investment, and technology obsolescence. Market development may expand reputation but can fail without sustainable partnerships. Market penetration can be dismissed as incremental, although it provides the quality foundation required for growth. The Ansoff Matrix should therefore be combined with feasibility assessment, risk management, and performance indicators.

Theoretically, this study contributes an education-specific operationalization of the Ansoff Matrix and demonstrates that strategy should be interpreted as a portfolio and sequence rather than a single quadrant choice. Practically, institutional leaders should establish decision gates for each initiative, including evidence of employer demand, regulatory feasibility, staff capability, lifecycle cost, partner commitment, and measurable outcomes. Suggested indicators include applicant demand, certification attainment, graduate employment, employer satisfaction, international participation, external training revenue, research utilization, and facility utilization.

## CONCLUSION

This study analyzed the strategic development of Politeknik Penerbangan Surabaya through the Ansoff Matrix. The findings show that all four strategies are relevant, but their roles and time horizons differ. Market penetration provides the foundation for quality and reputation. Product development is the strongest medium-term priority because new and upgraded programs, short courses, laboratories, and simulators can respond directly to emerging aviation competence requirements. Market development can extend proven offerings through national and international partnerships. Diversification offers long-term opportunities in applied research, digital training, startup incubation, consulting, and certification, but should be implemented selectively because it carries the highest resource and governance risks.

The study contributes theoretically by translating the product-market logic of the Ansoff Matrix into an aviation vocational education framework and by proposing a staged portfolio rather than an undifferentiated list of recommendations. For institutional leaders, the findings imply that strategic initiatives should be supported by decision gates, industry demand evidence, regulatory analysis, staff development, lifecycle financing, and measurable performance indicators. For policymakers, the results highlight the importance of enabling flexible program development, industry collaboration, digital infrastructure, and applied innovation within public vocational institutions.

The study is limited by its single-institution case design, dependence on stakeholder perceptions and institutional documents, and the absence of longitudinal outcome measures demonstrating the realized effects of each strategy. The transferability of the findings to other aviation or vocational institutions should therefore be evaluated carefully. Future research should

compare multiple vocational institutions, quantify the attractiveness and feasibility of each Ansoff option, examine employer and student demand, and use mixed methods to link strategic initiatives with graduate outcomes, institutional performance, financial sustainability, and innovation impact.

**AI Declaration**

The author acknowledges the use of artificial intelligence (AI) tools in supporting the preparation of this manuscript. The author remains fully responsible for the accuracy, originality, and integrity of the research and its findings.

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