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Original Article

Policy Analysis of University-Based Incubators: Model Projections for Animation Startups

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Abstract

University-based incubators play a pivotal role in reducing the high failure risks faced by animation startups, which require intensive infrastructure and strong IP management. This research evaluates the effectiveness of startup empowerment policies within two university-based incubators in Yogyakarta to formulate a replication model for Animation Study Programs. Utilizing an explanatory quantitative approach, the study analyzes secondary data from 40 technology-based startups using multivariate statistical techniques, specifically Multiple Linear Regression and Discriminant Analysis. The findings indicate that Synergy is the most dominant predictor of success (β = 0.280, p = 0.000), followed by Seed Capital and Shared Facilities. While regression analysis shows that institutional status does not directly influence overall effectiveness, discriminant analysis reveals fundamental differences in operational methodology, public university excel in providing seed capital and technical support through government grants, whereas private university demonstrate greater agility in managerial services and industrial networking. The research concludes that a successful animation startup model requires a three-pillar strategic projection, involving the optimization of high-end shared infrastructure such as centralized render farms, the management of specialized financial models including revenue sharing, and the acceleration of synergy through IP marketplaces and cross sector collaboration. These recommendations provide a roadmap for academic institutions to bridge the gap between research and the commercial demands of the creative industry.

Keywords: Animation Industry, Mathematical Modeling, Policy Empowerment, Technology-based Startup, University-based Incubator.

1. Introduction

In the current digital economy era, technology-based startups have emerged as primary engines of national economic growth through innovation and job creation (Widiastuti & Sulistyandari, 2024). One subsector exhibiting exponential growth, yet characterized by high barriers to entry, is the animation industry. As a segment of the creative industry, animation startups possess unique characteristics that distinguish them from conventional software startups, namely, the need for massive computing infrastructure, prolonged production cycles, and a heavy dependence on Intellectual Property management (Kolympiris & Klein, 2017). Despite significant market potential, startups in this sector are highly vulnerable to failure during their early stages (the "death valley curve") due to limited capital access, weak managerial capacity, and a lack of strategic market networks (Syifa et al., 2024).

Universities, as centers of intellectual excellence, hold a strategic role in mitigating these risks through the development of university business incubators. These incubators serve as

supporting ecosystems that provide structured policy interventions to nurture startups founded by students and alumni. A commonly utilized framework for evaluating the effectiveness of incubation policies is the 7S model, comprising Space, Shared, Service, Support, Skill, Seed Capital, and Synergy (Komarsyah et al., 2019). The implementation of 7S policies is crucial, as incubators must go beyond providing physical space to bridge the gap between academic research outcomes and the commercial demands of the highly dynamic animation industry (Rukmana et al., 2023).

While previous research has extensively evaluated business incubator performance, most studies remain confined to descriptive statistical analysis or simple comparative tests between institutions. A research gap persists in understanding how the factors within the 7S policy framework simultaneously shape a successful model for startups, and how institutional status (Public or Private) differentially influences this effectiveness. In the context of animation education, a profound understanding of which variables contribute most significantly is vital for department heads and incubator managers to allocate limited resources effectively.

This study aims to conduct an in-depth analysis of startup empowerment policies within university-based incubators using advanced statistical approaches. By applying Multiple Linear Regression with dummy variables, this research will examine the partial and simultaneous contributions of the 7S variables and the influence of institutional status on policy effectiveness (Ghozali, 2018). Furthermore, Discriminant Analysis will be employed to identify the key predictive factors that differentiate the incubation characteristics of public and private universities. Through the projection of this model, it is expected that more precise policy recommendations can be formulated for the development of animation startups within the higher education environment.

2. Literature Review

This section presents the theoretical foundation and a critical review of the literature relevant to the university business incubation ecosystem and the specific characteristics of the animation industry. The literature review is conducted to establish a robust conceptual framework for analyzing startup empowerment policies through the lens of the 7S variables (Space, Shared, Service, Support, Skill, Seed Capital, and Synergy).

The discussion begins by exploring the evolution of the university incubator's role within the digital economy, followed by a deconstruction of each element within the 7S policy framework as an instrument for strategic intervention. Furthermore, an analysis of the economic dynamics of the creative industry, specifically animation, is provided to contextualize the infrastructural and managerial challenges faced by emerging entrepreneurs. Finally, this section reviews the urgency of employing multivariate statistical methods as policy evaluation tools capable of delivering more precise, objective, and projectable analytical results for future policy development.

2.1. University-based Business Incubators

University-based business incubators have currently transformed from mere providers of physical facilities into providers of social capital and complex knowledge ecosystems. Rukmana et al. (2023) emphasize that the effectiveness of university business incubators is determined by the institution's ability to facilitate research commercialization through integrated support mechanisms and access to strategic resources. Furthermore Martak and Konecki (2026) argues that the role of these incubators has expanded to encompass the development of students' entrepreneurial identity and the enhancement of professional

competencies through experiential learning. This support has proven to be crucial in maintaining the sustainability of startups during their early stages, from conceptualization to market establishment (Martak & Konecki, 2026).

A robust university entrepreneurial ecosystem requires synergy between organizational strategies and the involvement of external actors to strengthen the support network for entrepreneurs (Tabas et al., 2024). In alignment with this perspective, the utilization of university intellectual assets and digital transformation serves as a primary driver for incubators to create higher economic value for their tenants (Hajli et al., 2025).

Audretsch et al. (2023) add that digitalization capabilities and flexibility in navigating technological disruption significantly determine the market resilience of student-led startups. This perspective is further reinforced by the findings of Vujovic and Baloutsos (2025),, who demonstrate that incubation success within an academic environment is heavily contingent upon the university's role as a "trusted intermediary" capable of integrating industrial technology trends into innovative collaborative formats. Furthermore, Kolympiris and Klein (2017) confirm that incubators within academic environments possess a competitive advantage in the form of direct access to technical talent and research infrastructure that general private incubators lack.

2.2. The 7S Policy Framework and Strategic Interventions

The 7S Model (Space, Shared, Service, Support, Skill, Seed Capital, and Synergy) remains a relevant evaluative instrument, yet it now demands a profound adaptation to the digital landscape. Syifa et al. (2024)identified that Seed Capital and Skill development serve as dominant predictors for the successful downstreaming of technological products. However, Vaz et al. (2022) caution that in the absence of value-added services (Service) and technical assistance (Support), the mere provision of physical space (Space) is insufficient to reduce startup failure rates. This is because contemporary entrepreneurs prioritize intangible resources and relational aspects within their incubation experience.

Aligned with this perspective, Lamine et al. (2018) emphasize that the effectiveness of strategic interventions now depends heavily on an incubator's ability to integrate "cognitive capital" through intensive mentoring that transcends basic physical facilities. Spigel (2017) highlights that the Synergy dimension is increasingly mediated by the development of networks and social capital, which enable startups to align product innovation with market demands through access to mentors and strategic partners. Furthermore, Nambisan et al. (2019) argue that within the digital economy, effective synergy must involve the integration of technological expertise with business agility to ensure competitive advantage and sustainable growth amidst market volatility.

2.3. Economic Characteristics of the Animation and Creative Industries

Startups in the animation sector face structural challenges distinct from those of conventional software startups. Vogel (2014) explains that the economics of the creative content industry are driven by high initial investment patterns (high sunk costs) coupled with extreme revenue uncertainty, particularly because the commercial success of media products depends heavily on audience reception and distribution dynamics. In the Indonesian context, Wikayanto et al. (2021) explain that the development of the Indonesian animation industry still faces structural constraints such as limited production funding, dependence on project-based work, and the need for stronger institutional and policy support to stimulate sustainable growth. These conditions often hinder the scalability of emerging animation studios and highlight the importance of supportive industry ecosystems and infrastructure.

Furthermore, Hollifield et al. (2015) in their research on media management, emphasize that creative content companies must manage "content risk" by diversifying their intellectual property portfolios in order to maintain financial stability. Recent studies reinforce this perspective. Sorenson et al. (2021) argue that the economics of digital entertainment industries have shifted toward ecosystem-based monetization models, where the value of audiovisual content increasingly depends on platform distribution, digital networks, and cross-media integration. In line with this view, Mahmudah et al. (2024) note that in the animation industry, revenue is frequently derived not only from production services but also from intellectual property licensing and derivative products, which can contribute significantly to long-term financial sustainability.

In addition, Fan and Feng (2021) emphasize that the competitiveness of the animation industry depends on the integration of technological innovation, talent development, and a coordinated industrial value chain. This argument is consistent with recent industry analyses showing that technological transformations, such as cloud-based production pipelines and real-time rendering engines, are increasingly reshaping animation production workflows and reducing operational costs.

Recent studies on Indonesia's animation ecosystem reinforce this argument. Nayaka and Dananjaya (2024) highlight that the growth of the Indonesian animation industry is strongly influenced by technological support, collaboration between education and industry, and improved access to digital distribution platforms. Yet, they also note that limited skilled human resources and access to capital remain significant challenges for emerging animation studios.

Similarly, Maheswari and Zahro (2024) emphasize that the animation sector has growing economic potential within Indonesia's creative economy, contributing to job creation and export opportunities. Nevertheless, strengthening professional training, industry collaboration, and innovation capacity is necessary to increase the competitiveness of local animation studios in the global market.

2.4. Multivariate Statistics in Policy Analysis

The use of multivariate statistical methods in evaluating public policy enables more accurate data-driven decision-making. Hair et al. (2006) state that multivariate techniques, including discriminant analysis, are effective for distinguishing the characteristics of different organizational groups based on multiple predictor variables simultaneously. These techniques are widely applied in organizational and policy research because they allow researchers to evaluate complex relationships among variables in a comprehensive manner.

In quantitative policy analysis, regression models are often employed to measure the influence of institutional characteristics on organizational outcomes. Ghozali (2020) explains that dummy variables in regression analysis can be used to represent categorical variables such as institutional status (e.g., public vs. private institutions), allowing researchers to statistically examine structural differences between groups. The inclusion of dummy variables enables researchers to quantify the comparative impact of institutional characteristics within regression frameworks.

Recent studies highlight the increasing importance of quantitative modeling in analyzing innovation ecosystems and institutional performance. For instance, Texeira-Quiros et al. (2022) demonstrate that the interaction between innovation strategies, quality management practices, and internationalization significantly affects the performance of higher education institutions, emphasizing the importance of rigorous quantitative analysis in evaluating institutional strategies. Similarly, Lu et al. (2024) emphasize that statistical and quantitative approaches are essential for identifying patterns and relationships within complex innovation ecosystems, where multiple institutional and environmental variables interact simultaneously.

From a methodological perspective, ensuring the validity of regression models requires rigorous testing of classical assumptions. Field (2024) emphasizes that assumption testing (normality, multicollinearity, and heteroscedasticity) is a critical prerequisite for obtaining reliable regression estimates. Without these diagnostic tests, statistical models may produce biased or inefficient estimates, ultimately weakening the reliability of policy recommendations derived from the analysis.

Furthermore, the use of multivariate approaches allows researchers to examine the simultaneous interaction of multiple policy variables. Tabachnick et al. (2007) explain that multivariate statistical techniques provide a comprehensive framework for analyzing complex relationships among variables, particularly when organizational outcomes are influenced by multiple interacting factors. In the context of higher education and innovation ecosystems, multivariate analysis therefore provides an integrated perspective for understanding how institutional status, resource allocation, and innovation strategies collectively influence organizational performance.

3. Methods

To address the research questions concerning the effectiveness of incubation policies and the influence of institutional status on the growth of animation startups, this study employs a quantitative approach utilizing multivariate statistical analysis techniques. The selection of this method is based on the necessity of observing the simultaneous interactions among the 7S policy variables, rather than merely conducting partial comparisons of means.

Through the application of multiple linear regression with dummy variables, this research will dissect the contribution of each policy factor toward incubation effectiveness while accounting for the unique characteristics of higher education institutions (public and private). Further, the implementation of discriminant analysis is intended to map the primary predictors that differentiate the support profiles between these two types of institutions. The integration of these two methods is expected to yield an accurate and applicable model projection for the development of business ecosystems within Animation Study Programs.

3.1. Research Design

This study employs an explanatory quantitative approach to examine causal relationships between policy variables and perform group classification. The primary focus of this research is to project the 7S policy model (Space, Shared, Service, Support, Skill, Seed Capital, and Synergy) onto the effectiveness of animation startup incubation by comparing two distinct institutional entities.

3.2. Population and Sample

This research utilizes secondary data from evaluation reports of 40 technology-based startup units incubated at two major universities in Yogyakarta, namely Universitas Gadjah Mada (representing public universities) with 20 respondents and Universitas Islam Indonesia (representing private universities) with 20 respondents (Kolympiris & Klein, 2017). The data comprises respondent perception scores regarding the seven policy dimensions, measured on a 1-5 Likert scale.

3.3. Identification of Variables

In this analysis, the variables are categorized as follows:

1. Independent variables ($X_1 – X_7$): the seven factors of the 7S policy framework.
2. Dummy variable (D): institutional status (1 for public universities, 0 for private universities).

3. Dependent variable (Y): incubation effectiveness index (a composite score derived from the accumulation of startup success perceptions).

3.4. Data Analysis Techniques

Data analysis is conducted in stages using IBM SPSS Statistics software through two primary methods:

1. Multiple Linear Regression

This method is used to examine the extent to which each 7S pillar influences incubation effectiveness while determining if differences in institutional status significantly affect the outcomes. The model equation being tested is:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7 X_7 + \beta_8D + \varepsilon \quad (1)$$

Where β_1 through β_7 represent the regression coefficients for the 7S factors, and β_8 is the coefficient for the university status dummy variable.

2. Discriminant Analysis

This analysis aims to construct a classification function that is mathematically capable of differentiating the characteristics between public and private university incubators. The discriminant function is formulated as follows:

$$Z = w_1X_1 + w_2X_2 + w_3X_3 + w_4X_4 + w_5X_5 + w_6X_6 + w_7 X_7 \quad (2)$$

The Wilks' Lambda statistics will be used to test the significance of the function, while the Structure Matrix will be analyzed to determine which variables serve as the strongest predictors (primary discriminators) between the two university types (Hair et al., 2020).

3.5. Classical Assumption Tests

Prior to drawing conclusions, the regression model will undergo a series of classical assumption tests to ensure model validity, including:

1. Normality Test
   Utilizing the Kolmogorov-Smirnov test to ensure that residuals are normally distributed.
2. Multicollinearity Test
   Conducted through Variance Inflation Factor (VIF) analysis to ensure no strong correlations exist among independent variables.
3. Heteroscedasticity Test
   To ensure that the variance of the residuals remains constant across observations (Ghozali, 2020).

4. Results and Discussion

This section presents the empirical findings derived from a series of multivariate statistical tests. The analytical workflow commences with classical assumption tests to ensure model validity, followed by multiple linear regression analysis to examine the impact of the 7S policies, and concludes with a discriminant analysis to map the diverging profiles between public and private higher education institutions.

4.1. Classical Assumption Tests

Prior to hypothesis testing, the regression model was evaluated to ensure compliance with the Best Linear Unbiased Estimator (BLUE) criteria.

1. Normality Test

Based on the Normal P-P Plot and the Kolmogorov-Smirnov test, the residual values are normally distributed along the diagonal line. This indicates that the model satisfies the prerequisites for significance testing.

2. Multicollinearity Test

The analysis results demonstrate that all variables yield a Variance Inflation Factor (VIF) ranging from 1.087 to 1.419. Since the VIF values are consistently below 10, it can be concluded that there is no correlation among the independent variables that would bias the model estimation.

3. Heteroscedasticity Test

The Scatterplot analysis shows that the data points are randomly dispersed above and below the zero line on the Y-axis without forming a specific pattern. This confirms that the residual variance remains constant, satisfying the assumption of homoscedasticity.

4.2. Multiple Linear Regression

Based on the data processing conducted via SPSS involving 40 respondents (20 tenants from UGM and 20 tenants from UII), an overview was obtained regarding the contribution of the 7S policy factors to the effectiveness of animation startup empowerment. Hypothesis testing was performed through partial testing to examine the significance of each individual variable. Table 1 presents the regression coefficients derived from the multiple linear regression analysis.

Table 1. Regression Coefficients Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	0.578	0.488		1.185	0.245		
	X1	0.031	0.055	0.060	0.566	0.576	0.920	1.087
	X2	0.145	0.057	0.283	2.559	0.016	0.839	1.192
	X3	0.160	0.071	0.274	2.270	0.030	0.705	1.419
	X4	0.002	0.051	0.004	0.037	0.971	0.867	1.154
	X5	0.132	0.064	0.237	2.076	0.046	0.789	1.267
	X6	0.215	0.054	0.433	3.988	0.000	0.874	1.144
	X7	0.280	0.070	0.480	4.011	0.000	0.717	1.395
	Institutional_Status	0.069	0.112	0.068	0.615	0.543	0.843	1.186

a. Dependent Variable: Y

Based on the table 1, the regression equation is formulated as follows:

$$Y = 0.578 + 0.031X_1 + 0.145X_2 + 0.160X_3 + 0.002X_4 + 0.132X_5 + 0.215X_6 + 0.280X_7 + 0.069D \quad (3)$$

According to the significance values (Sig.) in the table, the factors that exert a statistically significant influence on the effectiveness of animation startups are as follows:

1. Synergy (X_7): This factor emerges as the most dominant predictor, with a coefficient of β = 0.280 and Sig. = 0.000. This suggests that industrial networking is the primary key to the success of animation startups.

2. Seed Capital (X_6): Shows a significant influence (Sig. = 0.000) with a coefficient of 0.215. The availability of initial capital is a critical determinant of operational sustainability.
3. Shared Facilities (X_2): Exerts a significant impact (Sig. = 0.016) with a coefficient of 0.145. Shared facilities are vital for equipment-intensive industries such as animation.
4. Service (X_3) & Skill Dev (X_5): Both demonstrate significant influence with Sig. < 0.05 (0.030 and 0.046, respectively).
5. Conversely, Space (X_1), Support (X_4), and Institutional Status (D) do not show a statistically significant influence, as their significance values exceed the threshold (Sig. > 0.05). This indicates that in both public and private universities, the effectiveness of incubation is driven more by the quality of practical services and capital support rather than merely the legal status of the institution.

4.3. Discriminant Analysis

Discriminant analysis was performed to determine the policy factors that most significantly distinguish the incubation characteristics of Public Universities (UGM) and Private Universities (UII).

1. Model Significance (Wilks' Lambda)

Based on the SPSS output, the model significance test yielded a Wilks' Lambda value of 0.324 with a significance (Sig.) of 0.000. This indicates a statistically significant difference between the policy profiles of public and private institutions in supporting animation startups. The discriminant model demonstrates high power in successfully segregating these two institutional groups.

2. Dominant Discriminating Variables (Structure Matrix)

According to the Structure Matrix table, the primary variables acting as the strongest discriminators between public and private universities are:

a. Seed Capital (X_6): This variable exhibits the highest correlation with the discriminant function, confirming that the fundamental difference lies in the access to and the amount of initial capital provided.
b. Support (X_4): Serving as the second strongest discriminator, this suggests a divergence in the patterns of technical or research support.
c. Service (X_3): This reflects differences in the quality of managerial services provided by each institution.

3. Classification Accuracy

The discriminant model demonstrates a remarkably high accuracy rate of 92.5%. This implies that by observing an incubator's scores across the 7S factors, the model can correctly predict whether the incubator belongs to a public or private university in nine out of ten cases.

The discriminant results provide compelling insights when juxtaposed with the prior regression findings. Although the regression analysis indicated that Institutional Status does not exert a direct influence on the Outcome (Y), the discriminant analysis proves that the Process (X) or the operational methodology of the two institutions is fundamentally different.

The core strengths of the public university lie in Seed Capital and Support. This is consistent with the fact that public universities have greater access to government grants (such as Kedaireka or internal PTNBH funding), which are essential for the high-cost technical research required in animation.

Conversely, in private university the effectiveness is primarily driven by Service and Synergy. Given the more limited access to government grants compared to public counterparts, private universities tend to be more agile in developing managerial services and industrial networks to ensure their student-led startups remain independently competitive. In the context of Animation Study Programs, these findings imply:

1. Public university incubators should maintain their research and capital advantages while adopting the service agility observed in the private sector.
2. Private university incubators must continue to strengthen external networks to compensate for the limitations in initial capital availability.

4.4. Projection of the Animation Startup Development Model

This multivariate analysis provides a concrete illustration that the animation industry is a sector with high entry barriers due to its heavy reliance on technology and capital. Consequently, the projected model is categorized into three strategic pillars.

1. Infrastructural Projection (Optimization of Shared Facilities)

Given that Shared Facilities (X_2) exerts a significant influence, universities can no longer merely provide vacant workspaces. Future projections must prioritize:

a. Centralized Render Farm

Investment in local cloud computing infrastructure to reduce rendering time, which remains a primary bottleneck for student-led animation startups.

b. Motion Capture and Sound Studios

These facilities serve as the quality differentiator between amateur work and industry-standard productions. The availability of such high-end equipment within an incubator can reduce a startup production burden (sunk costs) by an estimated 40% to 60%.

2. Financial Projection (Seed Capital Management)

As Seed Capital (X_6) is the primary discriminator between public and private institutions, funding strategies are projected as follows:

a. Public Universities (Grant to IP Model)

Leveraging government or institutional grants for the development of original Intellectual Property (IP) involving high level technical research.

b. Private Universities (Revenue Sharing Model)

Due to more restricted grant access, private institutions are projected to adopt partnership schemes with professional studios. In this model, students undertake outsourced components of large-scale studio projects to secure the initial working capital necessary to fund their own independent IP.

3. Market and Networking Projection (Acceleration of Synergy)

As the variable with the strongest influence ($\beta = 0.280$), Synergy is projected to be achieved through:

a. IP Marketplace

The incubator acts as an agent or distributor, bridging the gap between student work and Over the Top (OTT) streaming platforms or media investors.

b. Cross Sector Collaboration

Connecting animation startups with other academic departments (e.g., Medical Sciences for medical animation or Engineering for architectural simulations) to expand market segments beyond the traditional entertainment sector.

5. Conclusion

This research establishes that the effectiveness of startup empowerment within university-based incubators is significantly determined by the pillars of Synergy, Seed Capital, and Shared Facilities, with industrial synergy serving as the most dominant predictor of success. While multiple linear regression analysis proves that institutional status exerts no direct influence on the final outcomes, discriminant analysis reveals distinct operational

profiles. Public universities excel in providing capital and technical research support through government grants, whereas private institutions demonstrate greater agility in managerial services and external networking. Theoretically, these findings strengthen the 7S framework within the creative economy ecosystem by highlighting how fundamental differences in policy intervention patterns rather than institutional status alone shape the incubation landscape for the animation sector.

As a strategic projection, the development of animation startups requires an integrated model focused on high-tech infrastructure such as render farms and adaptive funding schemes for Intellectual Property management to mitigate high initial operational costs. Although this study is limited to a specific sample in Yogyakarta and requires caution in national generalization, it underscores that bridging the gap between academic research and global commercial requirements necessitates a robust integration of technical support and cross-sector collaboration. Future research should therefore expand the geographical scope and explore external variables such as global copyright regulations to further validate these sustainability strategies. This holistic approach is essential for ensuring that student-led animation ventures can achieve long-term business sustainability in a competitive global digital market.

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