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Original Article

Policy for Empowering Technology-Based Startup Companies within University-Based Incubators

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Abstract

Technology-based startups play a critical role in driving innovation and economic growth, yet they remain highly vulnerable to early failure due to limited capital, weak managerial capacity, and insufficient market access. University-based business incubators have emerged as strategic ecosystems to nurture these startups by providing facilities, mentoring, training, and access to research networks and funding. This study aims to analyze the effectiveness of university business incubator policies in strengthening technology-based startup companies, using the 7S framework (Space, Shared, Service, Support, Skill Development, Seed Capital, and Synergy) as the analytical lens. An exploratory sequential mixed-methods approach was employed, beginning with qualitative interviews and observations, followed by quantitative surveys of 40 tenants (20 from a public university and 20 from a private university). The integrated findings reveal that the public university incubator (UGM) demonstrates stronger performance in service, support, skill development, and synergy, while the private university incubator (UII) shows relative advantages in space, shared facilities, and seed capital. Although all seven policy factors are generally effective, their priority differs across institutional contexts. These results highlight the need for differentiated policy design that recognizes the distinct strengths of public and private university incubators, while establishing the 7S framework as a national benchmark for evaluating startup incubation policies.

Keywords: 7S Framework, Business Incubator, Policy, Technology-Based Startup, University.

1. Introduction

Technology-based startups are widely recognized as key drivers of innovation and competitiveness, yet they face high risks of failure in their early stages due to limited resources and managerial experience (Stinchcombe, 1965; Terziovski & Hermel, 2011). Prior studies have shown that incubators can mitigate these risks by providing structured support such as mentoring, shared facilities, and access to finance (Aernoudt & José, 2020; Bergek & Norrman, 2008). In particular, university-based incubators are considered unique because they leverage academic resources, research outputs, and student talent to accelerate startup growth (Mian et al., 2012).

Despite these advantages, the effectiveness of university incubators remains uneven. Some studies highlight the importance of strong networks and investor engagement for startup survival (Pettersen et al., 2015), while others emphasize the need for differentiated models of incubation depending on institutional context (Pauwels et al., 2016). However, few studies have systematically examined how policy factors within university incubators such as

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space, shared resources, services, support, skill development, seed capital, and synergy shape the trajectory of technology-based startups, particularly in emerging economies like Indonesia.

Although university incubators function as important drivers in the development of technology-based startups through the provision of facilities, mentoring, and network access, their effectiveness is strongly influenced by the quality of support and governance models implemented. Research by Ramli (2024), Syifa et al. (2024), and Widyaningrum et al. (2024) shows that incubators capable of providing comprehensive services such as seed funding, managerial support, and network access have been proven to significantly improve startup performance and competitiveness. Analysis of digital incubators conducted by Gozali et al. (2020) also confirms that governance aspects such as tenant selection mechanisms, funding support systems, and relations with external stakeholders play a major role in determining the effectiveness of incubation programs. Furthermore, Fithri et al. (2024) highlight that incubators need to manage knowledge adaptively to avoid being trapped in knowledge inertia that can hinder startup development and reduce their innovative capabilities. Overall, these findings indicate the need for in-depth evaluation regarding how policies, services, and structures of university incubators affect the success of technology startups, especially in developing countries like Indonesia that still face challenges in strengthening their innovation ecosystem.

This study addresses that gap by analyzing the effectiveness of business incubator policies in two universities (one public and one private) using the 7S framework. Through the integration of qualitative and quantitative evidence, the research provides insights into how different institutional contexts prioritize policy factors and what this implies for designing more effective startup support policies. To improve the innovative ecosystem, the government encourages the establishment of startups as a "vehicle" for delivering inventions from research to market, supported by coaching and funding. This is expected to improve the dissemination of research results and the nation's competitiveness. On the other hand, the global economic crisis has worsened Indonesia's economic condition, leading to high unemployment (Priyo W. et al., 2024). Although the industrial sector has created many jobs, unemployment remains high.

The role of tech business incubators is crucial as startups are prone to fail early on due to lack of capital, difficulty implementing technology, poor business management, and lack of experience. Incubators provide mentoring, guidance, training, and access to finance and marketing to help startups survive and compete. Universities are considered conducive ecosystems for startup development due to their innovative human resources and access to more adequate facilities.

This study aims to analyze the effectiveness of business incubator policies on strengthening technology-based startup companies in universities to maximize startup innovation. The problems found are the abstract definition of business incubators in the 2013 Presidential Regulation, the lack of role of incubators in ensuring startup sustainability, differences in incubator services at home and abroad, and the absence of SOPs and integrated databases for incubators in Indonesia.

This research will answer questions about the development and factors that influence the policy of strengthening startups by university incubators, as well as success factors and evaluation of incubator policies in fostering startups. The benefits of the research are expected to be a reference for startup program organizers, enrich knowledge, and provide solutions to obstacles. This research is limited to a case study at one public university and one private university in Sleman Regency, with a sample of 20 startups from each university. This study

is different from previous studies that focus on the role of legitimacy for startups or the impact of tax policy on e-commerce, because this study specifically examines the level of effectiveness of policies to strengthen technology-based startup companies.

2. Literature Review

Technology-based startups remain vulnerable to early failure, but incubators have been shown to mitigate these risks by providing structured support. Earlier studies emphasized legitimacy and resource provision (Hannan & Carroll, 1992; Stinchcombe, 1965), yet more recent research has shifted toward the role of university-based incubators in fostering innovation and commercialization. Recent studies highlight several key insights:

1) Knowledge-based perspectives show that incubators enhance performance when they integrate academic research and entrepreneurial training (Fithri et al., 2025).
2) Higher education incubators face both supporting factors and barriers, including access to facilities, mentoring quality, and institutional commitment (Rukmana et al., 2023).
3) In emerging economies, incubators contribute to sustainable startup development by bridging gaps in funding and market access (Fithri et al., 2023).

These recent findings complement earlier frameworks (Aernoudt & José, 2020; Bergek & Norrman, 2008; Mian et al., 2012) by emphasizing the policy dimension of incubation. They suggest that effectiveness depends not only on resources but also on how policies are designed and implemented within universities.

Thus, while survival theory explains why startups are at risk, contemporary incubator research demonstrates how university-based policies which structured around factors such as space, shared resources, services, support, skill development, seed capital, and synergy can strengthen technology-based startups. This study builds on that literature by comparing public and private university incubators in Indonesia, addressing a gap in recent scholarship that has not systematically examined policy effectiveness in this context.

3. Methods

This research uses an exploratory sequential qualitative-quantitative mixed method that starts with qualitative data collection to explore an unknown phenomenon or problem, followed by quantitative data collection to confirm qualitative findings and test their generalizability, with the following steps.

3.1. Qualitative data analysis

In the early stages, researchers collect qualitative data to explore problems or phenomena that are not yet fully understood. Qualitative data can be obtained through interviews, focus group discussions (FGDs), observations, or documents. After that, qualitative data is analyzed to identify relevant themes or patterns. The following are the steps of qualitative data analysis.

1) Data Coding: The first step is data coding, where the researcher marks relevant segments of data with a specific code. These codes represent concepts or ideas found in the data (Creswell & Clark, 2017).
2) Grouping and Categorization: After coding, similar codes were grouped into larger categories or themes.
3) Identification of Major Themes: Based on the clustering and categorization, the researcher identified the main themes that emerged from the qualitative data.

4) Thematic Analysis: At this stage, the researcher interprets the themes that have been identified to provide a deeper understanding of the phenomenon under study (Braun & Clarke, 2006).
5) Quantitative Instrument Development: Findings from qualitative analysis are used to design quantitative instruments, such as questionnaires or surveys, which will be used in the next stage to collect quantitative data.

3.2. Quantitative data analysis

Once the qualitative data has been analyzed, the researcher then collects quantitative data to test or confirm the findings from the qualitative data. Quantitative data is usually collected through surveys or questionnaires that are organized based on the qualitative findings. The following are the steps of quantitative data analysis.

1) Descriptive Statistics: The first step in quantitative data analysis is descriptive analysis to describe data characteristics, such as frequency, mean, median, and standard deviation (Creswell & Clark, 2017). This provides an overview of the data distribution and patterns that exist.
2) Hypothesis Testing (Inferential): Researchers may conduct statistical tests to test hypotheses or relationships found in the qualitative stage. For example, to test the difference between groups or the relationship between two variables, t-test or ANOVA may be used.
3) Regression: If the researcher wants to test the cause-and-effect relationship between variables, regression analysis can be used. Regression allows the researcher to identify the factors that influence the dependent variable.
4) Correlation Test: If the researcher seeks to finding out if there is a relationship between two variables, correlation tests such as Pearson's r or Spearman's rho can be used.

3.3. Integration of qualitative and quantitative data

The integration process allows researchers to combine both types of data to describe or explain phenomena more comprehensively. The steps for integrating qualitative and quantitative data are as follows.

1) Triangulation: Triangulation is a technique to confirm the results from qualitative and quantitative data. If the findings from both types of data support each other, then the findings can be considered more valid and credible. If there is a difference, the researcher will analyze further to understand the cause of the difference (Teddlie & Tashakkori, 2009).
2) Complement each other: Qualitative findings that provide an in-depth understanding of the factors influencing a phenomenon can be enriched and tested with quantitative data that confirm the extent to which those factors have an effect on the wider population. Conversely, quantitative data can also help researchers understand how significant the results obtained from qualitative data are.
3) Drawing Comprehensive Conclusions: After integrating both types of data, the researcher draws conclusions that describe the phenomenon or problem more thoroughly. This includes the aspects found from the qualitative data and how general or significant the findings are when tested using quantitative data.

3.4. Interpretation and report preparation

The results of the qualitative and quantitative analyses are interpreted to draw more holistic conclusions and propose recommendations based on the findings. Research reports usually include how qualitative findings support quantitative findings and vice versa, as well

as how these two types of data work together to provide a deeper understanding of the phenomenon under study.

4. Results and Discussion

4.1. Research Results

An effectiveness analysis of university-based business incubator policies on technology-based startup companies was conducted using an exploratory sequential qualitative-quantitative mixed-methods approach. The findings are as follows. Researchers will test the effectiveness of business incubator policies based on the 7S factor (Space, Shared, Service, Support, Skill Development, Seed Capital, and Synergy) on strengthening technology-based startup companies. In this study, 40 tenant samples were randomly selected, namely 20 tenants from public universities (UGM) and 20 tenants from private universities (UII). Furthermore, tenants were asked to provide an assessment of the effectiveness of the business incubation policy that had been provided during the incubation period of approximately 1 year, with the following results shown in table 1.

Table 1. Effectiveness Level of Policy Factors

Incubator	Tenants	Policy Factors						
		Space	Shared	Service	Support	Skill Dev.	Seed Capital	Synergy
UGM	1	3	3	4	5	2	3	3
	2	4	3	5	2	3	2	4
	3	2	4	3	2	4	5	3
	4	5	2	3	4	3	4	2
	5	3	2	5	3	4	2	4
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	19	3	3	4	3	3	3	4
	20	3	3	4	5	4	2	4
UII	1	4	3	5	3	3	3	3
	2	5	2	4	4	2	4	5
	3	2	5	3	2	3	2	2
	4	2	4	5	3	5	4	3
	5	3	2	4	2	2	2	4
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
	19	5	4	5	4	3	2	4
	20	4	4	3	4	4	3	3

[1]Very Ineffective, [2]Ineffective, [3]Moderately Effective, [4]Effective, [5]Very Effective

Source: Processed data, 2025

Based on the factors tested, the statistical test that can be used is the One-Way Anova test. However, to perform the One-Way Anova test, several assumptions must be met. If one of the assumptions is not met, then a nonparametric statistical test using the Kruskal Wallis test must be performed.

4.1.1. Statistical test of policy factors' effectiveness

In order to do statistical tests, it is necessary to test the assumptions first before testing the hypothesis to determine the most appropriate type of test to use. The results of normality test conducted are shown in table 2.

Table 2. Normality Test Results

Policy Factors	*p*-value*	
	UGM	UII
Space	0.025	0.017
Shared	0.016	0.018
Service	0.013	0.023
Support	0.005	0.002
Skill Development	0.028	0.013
Seed Capital	0.008	0.018
Synergy	0.018	0.023

*Statistically significant at p=0.05

Source: Processed data, 2025

Table 3 displays the Homogeneity of Variances test results, providing an assessment of whether the variance distribution across groups is statistically uniform.

Table 3. Homogeneity of Variances Test Results

Incubator	*p*-value*
UGM	0.437
UII	0.844

*Statistically significant at p=0.05

Source: Processed data, 2025

Based on the output in the table above. the effectiveness level data is not normally distributed but has the same variance. Each observation in different groups must be independent. This means that the value of one observation should not influence the value of other observations. The effectiveness levels for each factor of the UGM and UII incubator policies are not interdependent or influential. Therefore, the effectiveness level data is independent. Based on the above assumption test, there is one assumption that is not met, which means that nonparametric statistical test, i.e. Kruskal Wallis test, will be used in this research. Table 4 presents the results of the hypothesis testing.

Table 4. Hypothesis Test Results

Incubator	*p*-value*
UGM	0.399
UII	0.675

*Statistically significant at p=0.05
* Analyzed using Kruskal-Wallis test

Source: Processed data, 2025

As in table 4, there is no difference exist in the effectiveness of the seven policy factors, which means that the incubator policy factors at UGM and UII are equally effective.

4.1.2. Differences in the effectiveness of policy factors between incubators

Furthermore, an assessment was conducted to determine whether any differences existed in the effectiveness of policy factors between the UGM incubator and the UII incubator. The preceding normality test indicated that the data for the seven policy factors from each incubator were not normally distributed; therefore, a nonparametric procedure, the Mann Whitney test, was applied. As before, assumption tests are also required before performing the Mann-Whitney test as follows.

1) Independence of Observation: each value in one group is independent of values in other groups (Gibbons & Chakraborti, 2011). The tenants of the UGM incubator and the UII

incubator are two different groups of individuals, and their responses do not influence each other, so the observations are independent.

2) Minimum Ordinal Data Scale: The data must be at least ordinal, can also be used for interval or ratio (Nachar, 2008). The effectiveness level of each university's policy factors is rated on an ordinal scale from 1 to 5, representing "very ineffective" to "very effective".

3) Independent and Random Sample: The sample should be randomly selected and represents the population that wants to be compared (McKnight & Najab, 2010). The sample was randomly selected from each population, where the researcher randomly selected tenants from each business incubator to be interviewed regarding the level of effectiveness they felt during the business incubation program.

Since all assumptions are met, a hypothesis test can be performed. The results generated from the Mann-Whitney test are summarized in Table 5, providing evidence regarding variations in policy factor effectiveness across incubators.

Table 5. Mann-Whitney Test Output

Test Statistics[a]	
	Effectivity Level
Mann-Whitney U	9059.000
Wilcoxon W	18929.000
Z	-1.142
Asymp. Sig. (2-tailed)	.254

a. Grouping Variable: Incubator

*Statistically significant at p=0.05

Source: processed data, 2025

Based on the output in table 5, there is no difference in the effectiveness of policy factors between the two university incubators, which means that the policies given by both university incubators to tenants are equally effective.

4.1.3. Policy factors analysis based on effectiveness scores average

Based on the statistical analysis above, all seven policy factors are equally effective in strengthening technology-based start-ups. However, an in-depth analysis is required to determine how effective these policy factors are. A further analysis was done by calculating the average score per policy factor for each university and the results are presented in table 6.

Table 6. Average Policy Factors Effectiveness Score

Policy Factors	Average Score	
	UGM	**UII**
Space	3.40	3.50
Shared	3.20	3.45
Service	3.80	3.65
Support	3.75	3.15
Skill Development	3.50	3.15
Seed Capital	3.35	3.40
Synergy	3.65	3.40

Source: processed data, 2025

As shown in table 6, the results show that UGM performed better in terms of Service, Support, Skill Development, and Synergy. Meanwhile, UII performed better in terms of Space, Shared, and Seed Capital. The 'Support' factor showed the biggest difference between UGM (3.75) and UII (3.15).

4.2. Discussion

This study analyzes the contribution of seven business incubator policy factors (Space, Shared, Service, Support, Skill Development, Seed Capital, and Synergy) to the effectiveness of strengthening technology-based startups. Qualitative data provides an in-depth explanation of the field dynamics, while quantitative data shows the effectiveness of each policy factor based on tenant assessments.

In terms of space availability, the qualitative findings reveal that co-working space is a primary need for tenants. Although a digital-based work system can be implemented, workspace is still necessary as a place to collaborate with teammates. UGM provides office space, but it is still not optimally used, while UII is better prepared in providing workspaces for tenants. From a quantitative perspective, UGM has an average score of 3.40, lower than UII's 3.50. In this digital era, co-working space remains essential for tenants as a place to collaborate with team members and other tenants. The quantitative data showed that the average effectiveness of the 'Space' policy factor at UGM was lower than at UII, supporting the results of tenant interviews which stated that the utilization of co-working space at UGM was still not optimal.

Regarding shared facilities, the qualitative assessment indicates that access to shared facilities supports operational efficiency. Tenants say that access to tools, prototyping, or market data is very helpful in the early stages of incubation. At UGM itself, access to facilities is sometimes quite difficult due to bureaucracy and the lack of co-working spaces at that time. Meanwhile, UII provides co-growing spaces, co-working spaces, and training centers in its business incubator, making it easier for tenants to access available resources. Quantitatively, UGM has an average score of 3.20, which is lower than UII's 3.45. Shared resources play an important role, especially in the early stages of incubation. The quantitative data supports the qualitative data, which states that access to resources at UGM has not been fully utilized by tenants.

When examining services provided, qualitative findings show that UGM and UII both provide business incubation services in three stages, which are pre-incubation, incubation, and post-incubation. The incubator is actively involved in the process. However, post-incubation services are considered insufficient, proven by the decreased intensity of communication between tenants and the incubator after the incubation period ends. From the quantitative standpoint, UGM has an average score of 3.80, higher than UII's 3.65. Adaptive consulting services are a major added value and are highly effective both in terms of perception (qualitative) and direct impact (quantitative). This is supported by the highest quantitative score with a relatively small difference of 0.15.

In terms of support mechanisms, qualitative data reveals that the incubator provides business coaching support during the incubation period in the form of training, mentoring, networking, and access to various facilities provided by the incubator. UGM tenants felt that the training schedule provided by the incubator was very tight, which certainly provided a lot of additional insight for tenants to develop their businesses. Conversely, UII tenants felt that the incubator's support was still not optimal because the training provided did not cover all their needs. Quantitatively, UGM has an average score of 3.75, which is higher than UII's 3.15. From an integrative interpretation, mentoring is a key pillar of incubator effectiveness. Qualitatively, the support policy at UGM is considered more effective compared to the UII incubator, which is supported by scores in quantitative data that show the policy has a significant impact on tenants at UGM.

Concerning skill development, the qualitative assessment indicates that theoretical training is very useful at the early stages of incubation, with tenants needing more technical

and business training. Quantitatively, UGM has an average score of 3.50, which is higher than UII's 3.15. The training program must be aligned with the tenants' level of maturity, with a need for more practical and case study-based advanced training. UGM facilitates tenants to directly practice the process of seeking investors through business pitching and business matching activities. In comparison, UII primarily supports tenants through coaching activities featuring guest speakers. In other words, UGM is perceived as more effective in implementing its policies, supported by higher quantitative scores than UII.

With regard to seed capital, qualitative findings show that both UGM and UII tenants feel greatly supported by the Technology-Based Startup Entrepreneur Program, which provides them with sufficient capital to develop their businesses. Funding sources can be accessed from both internal and external sources. Quantitatively, UGM has an average score of 3.35, which is not much different from UII's 3.40. From an integrative interpretation, the initial capital that both business incubator tenants got came from the Technology-Based Startup Company Program grant and/or UBIC funds, with the amount depending on the budget plan submitted by the tenants. Qualitative results indicate that this policy factor is quite effective for both tenants of the business incubator. This is proven by the quantitative score, which shows a very small difference of 0.05, indicating that the policy factor is equally effective. The difference in scores indicates new initiatives or positive perceptions from tenants in the UII incubator.

Finally, regarding synergy, qualitative data emphasizes the importance of access to investors, partners, and markets. During the incubation period, the UGM business incubator facilitates tenants in presenting their business products to investors through business matching and business pitching activities, as well as offering an extensive business network from various fields. Meanwhile, the UII incubator facilitates its tenants through collaboration with various events. Quantitatively, UGM has an average score of 3.65, higher than UII's 3.40. From an integrative interpretation, synergy and networking are game changers for a startup, with their effects being consistent and powerful in accelerating the scale-up of technology companies. Qualitative results show that UGM tenants are connected to UGM's business incubator network through business matching activities and provided with face-to-face discussion opportunities with potential investors. Meanwhile, the UII incubator facilitates tenants through collaborative events to introduce tenants and the incubator. The quantitative scores indicate that the UGM incubator demonstrates higher effectiveness in this area.

5. Conclusion

The primary objective of this study was to analyze the effectiveness of university-based business incubator policies in strengthening technology-based startup companies, using the 7S framework (Space, Shared, Service, Support, Skill Development, Seed Capital, and Synergy) as the analytical lens. The integrated findings demonstrate that while all seven policy factors are generally effective, their priority differs across institutional contexts. The public university incubator (UGM) shows stronger performance in service, support, skill development, and synergy, whereas the private university incubator (UII) exhibits relative advantages in space, shared facilities, and seed capital. These differences highlight that policy design for startup incubation must be differentiated according to institutional characteristics, while maintaining the 7S framework as a benchmark for evaluating incubation effectiveness.

Overall, the study contributes to the literature by providing empirical evidence on how university-based incubator policies shape startup development in Indonesia, and offers practical implications for policymakers and incubator managers to strengthen the

sustainability of technology-based startups. Practically, the results suggest that Indonesian university incubators should adopt tailored strategies: public universities can leverage their research capacity and networks to strengthen innovation-driven startups, while private universities can focus on market access and flexible business services. For policymakers, the findings provide evidence to design differentiated incubation policies and establish national standards based on the 7S framework to ensure consistency and sustainability across institutions.

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