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Practicality and Effectiveness of New Technopreneurship Incubator Model in The Digitalization Era

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ABSTRACT

The development of business incubators within colleges is gaining traction in Indonesia as a strategic approach to fostering business start-up innovation and enhancing entrepreneurial interest among younger generations. It is widely believed that these incubators can serve as effective methods to stimulate business innovation and entrepreneurial endeavors among students, alumni and businessmen. **This study aims** to evaluate the practicality and effectiveness of a newly designed incubator model, as perceived by experts and tenants. Data were collected through interviews and questionnaires distributed to five entrepreneurship course lecturers and ten entrepreneurial groups. **The findings** reveal that the practicality of the designed model was assessed using the Total Response Rate (TRR), which resulted in an 89.2% score, placing it in the "very practical" category. **These results** suggest that the technopreneurship incubator model is easy to understand and can be effectively implemented. The model effectiveness was further evaluated through pretest and posttest results, with average scores of 78.90 in the cognitive domain, 79.40 in the affective domain, and 84.54 in the psychomotor domain. In conclusion, All assessment criteria fell into the "very effective" category, validating the incubator model as practical and effective. **In conclusion,** the developed technopreneurship incubator model successfully cultivates and enhances the entrepreneurial spirit, abilities, knowledge, and skills of students and alumni.

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1. INTRODUCTION

In an era of globalization and rapid technological development, digitalization, the need for business incubators is increasing [1]. Business incubators play an important role in supporting the growth of start-ups by providing the resources and guidance needed to succeed further in the digitalization era [2, 3]. By definition, a business incubator is an organization designed to accelerate the growth and success of a startup through the range of resources and services it provides [4]. Incubators provide workspace, early funding, guidance from experienced mentors, and access to a vast business network. Big businesses have more resources, however they react to changes in the environment more slowly [5, 6] whereas start-ups are naturally flexible but have limited resources to handle growth challenges [7, 8].

Startups are companies that are in the early stages of development. It was found that various mechanisms influence the kind of incubator as well as the business model [9]. Furthermore, the mechanisms dictate the kinds of interventions required to bring about particular results and showed that the mechanisms used at each step of the incubation process determine the origin and dynamics of incubator growth as well as the operation of the incubation process [10].

The business incubation process model was developed by [7] and then extended and incorporated external environmental factors [11, 12], namely incubator affiliation and support systems also visualized an incubator as "a system that confers 'structure' and 'credibility' on incubates while controlling a set of assistive resources" [13, 14]. Their model has four basic value-adding activities or services whereby incubators contribute to the performance of the Business incubators and are here to help overcome this challenge by providing the support they need [15–17]. In incubators, the young business can learn from the experiences and failures of others, thus accelerating their learning curves and increasing their chances of success as they do [18–20].

One of the main benefits of business incubators is the practicality they offer. Incubators provide direct access to vital resources such as workspaces, equipment, and technology without a huge initial cost. This allows startups to focus on product development and their business strategy without having to worry about high operating costs. This practicality is crucial in the early stages of business development, where time and resource efficiency are critical. The effectiveness of business incubators can be seen from the success rate of the startups they support. By providing structured guidance and support, incubators help startups avoid common mistakes and accelerate their growth. Many studies show that startups that follow incubator programs have a higher chance of success compared to those that do not [21, 22]. Incubators also often help startups gain access to further funding from investors, which is a key factor in business growth [23].

Technopreneurship incubators not only foster business growth and innovation but also align with global sustainability initiatives, particularly the United Nations Sustainable Development Goals (SDGs). They support startups that contribute to sustainable development, with a significant role in SDG 4 by enhancing digital literacy, business acumen, and entrepreneurial skills among students and young professionals. By offering structured mentorship, access to digital tools, and practical training, incubators provide dynamic learning environments that complement formal education. They also align with SDG 8 by creating job opportunities, reducing barriers for entrepreneurs, and supporting small businesses, as well as providing training in digital entrepreneurship, business modeling, and financial management.

Technopreneurship incubators contribute to SDG 9 by promoting research and technological advancement, offering access to digital tools and investment resources, and supporting businesses in smart manufacturing, AI, and blockchain. They play a key role in SDG 10 by supporting underrepresented entrepreneurs, such as women, low-income individuals, and persons with disabilities, and provide global market access through digital platforms. Furthermore, incubators support SDG 11 by helping startups develop smart city solutions and urban resilience technologies, while promoting sustainable business models under SDG 12 through environmentally friendly practices and green business incubation. Collaboration for SDG 17 is vital, and incubators foster partnerships between academia, industry, government, and investors to amplify the impact of startups. By aligning with the SDGs, incubators bridge the gap between innovation and sustainable development, contributing to both business success and social progress. As digital transformation continues to shape the global economy, incubators will play a crucial role in fostering inclusive, sustainable, and technology-driven entrepreneurship.

Achieving incubator objectives is limited by the adoption of a general model that may not suit the unique characteristics of each startup. Research is needed to create a more flexible incubation model, considering factors like industry, startup development stage, and team needs [24]. The quality and availability of mentors significantly impact startup success, but not all incubators have access to qualified mentors in various fields. Access to professional networks and resources is also essential for growth and innovation. According to [25], entrepreneurial intentions are influenced by attitude, subjective norms, and perceived behavioral control, with students confidence in their online business success being crucial. The study highlights the importance of education and training in fostering innovation and economic growth among Jordanian business students.

Many incubators face challenges in providing adequate access to industrial networks, investors, and technological resources. They often focus on short-term success metrics like graduation or funding, but there is a gap in measuring long-term success post-incubation. Sustainable innovation facilitation is key, and further research is needed to establish best practices for creating a culture of innovation within incubators [26]. It's important to explore how incubators can better support startups in identifying innovation opportunities and

commercializing ideas. One possible issue is the one-size-fits-all approach, which may not address the unique needs of different startups. Challenges such as restricted access to mentors, networks, and financial constraints can hinder an incubator's ability to provide the necessary resources. Many incubators measure success based on short-term metrics, potentially overlooking long-term sustainability, which impacts their ability to foster innovation.

Some researchers have adapted the incubator model to be more flexible and tailored to specific industry needs by improving mentor quality, expanding networks through collaborations with large institutions, and attracting qualified mentors with appropriate incentives. They also build strategic partnerships with companies, investors, and research institutions to provide broader resources for startups. Additionally, incubators aim to develop long-term success metrics that assess sustainable growth, scalability, and innovation while fostering collaboration, experimentation, and creativity. Collaboration between large corporations and startups is recognized as beneficial for innovation [27], and research by [28] emphasizes balancing work ethics and traditional values to enhance competitiveness and career opportunities. By addressing these gaps, incubators can more effectively support startups toward sustainable success. Business incubators help startups thrive, contributing to the growth of successful companies [29, 30]. According to [31], follow-up models have focused on technology or business incubators [32], and recent literature has explored the incubation process and its relationship with stakeholders like government and universities. Previous studies [33–35] haven't fully measured the success of incubator models. Technopreneurs in educational institutions play a crucial role in fostering innovation and spreading positive perceptions of schools [36–38]. No research has specifically focused on measuring the practicality and effectiveness of incubator methods, making this study essential in addressing the gap by examining the practicality of various incubator models and their impact on startups in university.

2. RESEARCH METHODS

This research was carried out by conducting a review of existing literature on business incubators, models applied, success metrics used, and dissemination of questionnaires and interviews. Collecting data through surveys and interviews with business incubator lecturers, mentors, and startup founders to gain insight into their experiences with various incubation methods. Doing case studies in applying models that have been developed to understand how practicality is applied and measured in different contexts. Developing comprehensive metrics to measure the level of practicality of incubator methods and the effectiveness of the model.

2.1. Research Design

To achieve the objectives, the research design namely:

- The analysis phase involves conducting a needs analysis of the incubator model based on the technopreneurship concept, incorporating feedback from incubator students and the management staff of the Faculty of Engineering at the University of Ibnu Sina.
- The design phase means that researchers design incubator models based on technopreneurship regarding the concept of a Technology-Based Business Incubator Model.
- Development phase: researchers conduct the development of incubator models based on technopreneurship by conducting validity and practicality tests through Focus Group Discussion (FGD) with the involvement of several experts in the field of entrepreneurship practitioners, entrepreneurial incubators managers, academics in enterprise field and Indonesian linguists.
- The implementation phase is conducting limited testing by implementing a model of a technopreneurship incubator that has been developed for students participating in two classes of entrepreneurship courses with each participating 25 students with a total 50 students.
- The evaluation phase is an analysis to determine the level of practicality and effectiveness of the implementation of the business incubator model that has been designed.

2.2. Population and Samples

The population for this research comprised ten start-up businesses and five business mentors. The sample size included 50 students for the pre-test and 20 students for the post-test.

2.3. Instruments and Procedures

- Data Collection
  Conducting a practicality test involves assessing the feasibility and usability of a model in real-world conditions. This typically requires the collection of various types of data to evaluate different aspects of practicality. Here are some instruments and procedures for Data collection:
  - Surveys and Questionnaires using subjective data on incubators, satisfaction, and perceived ease of use using googleform. Questions that cover all aspects of practicality, such as Presentation eligibility, content eligibility, construction, linguistics, and Likert scales were used as open-ended questions.
  - Interviews were conducted with in-depth insights and qualitative data from lecturers and incubator participants. Interviews in person, over the phone, or via video conferencing. Record the interviews (with permission) for later analysis.
- Usability Testing
  Assess how easily users can achieve their goals using the model.
- Focus Groups
  Obtain collective feedback and facilitate discussion among lecturers and start-up participants. by selecting a diverse group of users to provide a range of perspectives.
- Pilot Testing
  Conducting a small-scale implementation to identify potential issues before a full rollout. Using a combination of these instruments and procedures ensures a comprehensive evaluation of the practicality of a tool, method, or system. By collecting both qualitative and quantitative data, you can gain a holistic understanding of its usability, efficiency, and overall user satisfaction.

3. RESULT AND DISCUSSION

3.1. Practicality Analysis

Practicality analysis is determined from assessments of mentor observations and tenant responses using a Likert scale. The practicality is reviewed from the ease of the model being used and understood in learning. Data analysis practicality development of this business incubator model using the following steps:

- Give a response score with the criteria: 1 = Very disagreeable 2 = disagree, 3 = Enough agreed, 4 = Agree, 5 = Totally Agree
- The determination of practicality is done by employing descriptive statistical analysis through the conversion of quantitative to qualitative data as shown in the Table 1.

Table 1. Quantitative Conversion to Qualitative

No	Skala	Quantitative Data	Qualitative Data
1	1	$< 20\%$	Not at all practice
2	2	20% - 40%	Less Practical
3	3	41% - 60%	Practical enough
4	4	64% - 80%	Practical
5	5	81% - 100%	Very Practical

Table 1 presents the conversion of quantitative to qualitative data for understanding purposes. The following formula was used to calculate the practicality of the product in the questionnaire.

$$\text{Practicality Score} = \frac{\text{Total Score}}{\text{Maximum Total Score}} \times 100\% \quad (1)$$

The practicality of the designed model book and tenant guide was evaluated based on the perceptions of incubator participants (tenants). According to the results, the Technopreneurship incubator model book was

rated with an average respondent rate of 93.2%, which falls under the ”highly practical” category. Similarly, the tenant manual received an average respondent rate of 92.2%, classifying it as ”very practical.”

Furthermore, the practicality of these products was also assessed from the perspective of the coaches. The Technopreneurship incubator model book garnered an average respondent rate of 89%, which places it in the ”practical” category. The incubator manual, on the other hand, achieved an average respondent rate of 92.2%, placing it in the ”very practical” category. These results demonstrate that both the model book and the incubator guide are effective tools for e-commerce-based incubation.

3.2. Effectiveness Analysis

3.2.1. The Result of The Cognitive Aspect

The learning outcomes in the cognitive domain were assessed to measure improvements by administering pre-test and post-test questions to 50 students. This was done before and after they received an entrepreneurial qualification, using a 20-item multiple-choice questionnaire designed to evaluate their knowledge and understanding of entrepreneurship, as well as the impact of the qualification. For the affective domain, learning outcomes focused on evaluating students attitudes and behaviors related to entrepreneurship. This included assessing their self-confidence, risk-taking ability, task and results orientation, creativity and innovation, leadership, and future orientation. The assessment technique involved giving the same group of 50 students pre-test and post-test questions, along with business practice tasks, to measure changes in their enthusiasm and entrepreneurial spirit before and after receiving the qualification. To design the development of the technopreneur-ship incubator model as well as to test the practicality and effectiveness of the model to be developed, the researchers conducted three stages, namely: Stage I of preliminary research is to perform need analysis and design product model design, Stage 2 of development research with validity and practicality testing, and Stage 3 conducting testing and evaluation of models. ADDIE's R&D procedures were used to develop an incubator model.

3.3. Validity and Reliability Test for Research Instruments

3.3.1. Validity and Reliability Test

The findings of the validity test conducted using Aiken V on the research instrument by five experts in the viability of the instrument's content revealed that, overall, the evaluation had an average score of 0.82 with a valid category. For the tenant instruments are valid since the r value is bigger than r table. For the reliability test also the score is higher than 0.6.

3.3.2. Effectiveness Test Results

The effectiveness of the model is seen from the achievement of the objective of the development of an e-commerce-based technopreneur-ship incubator model, namely the improvement of knowledge, attitudes and behaviour (character) as well as the skills of students (as tenants) in conducting their business. Measurements and indicators that can be used to test the effectiveness of the technopreneur-ship incubator model include the improvement of knowledge based on cognitive fields, attitudes and character (affective fields) by using pretests and posttests and improvements of skills (psychomotor field) through the results of the implementation of the effort. From the results of the test using SPSS V26, the effectiveness of these three aspects was very effective.

Table 2. Summary of Effectiveness Test of Technopreneurship Incubator Model

No	Effectiveness Test	Average (pretest)	Average (posttest)	T-Test sig (2-tailed)	Explanation
1	Cognitive	78.90	85.50	$0.00 < 0.05$	Very Effective
2	Affective	79.40	88.50	$0.00 < 0.05$	Very Effective
3	Phsicomentric	79.85	84.54	$0.00 < 0.05$	Very Effective

The T-test results in the given table are highly significant, as indicated by the p-values (sig 2-tailed) being 0.00, which is less than the commonly used threshold of 0.05. Table 2 presents The first cognitive aspect with a posttest score of 85.50 greater than the pretest value of 78.90 with sig. 2-tailed $0.00 < 0.05$ shows that the incubator model can improve the motivation and knowledgeability of the tenant in support of the implementation of the undertaking to be undertaken. The second is the affective aspect (the attitude and the soul of the entrepreneur tenant) the posttest value of 88.50 is larger than the pretest rating of 79.4 with 2 sig. 2 tailed $0.00 < 0.05$, this shows that the application of the e-commerce-based technopreneurship incubators

model can enhance the spirit and entrepreneurial spirit of the student, i.e. the attitude of willingness and courage to start and take risks, confidence that they can do it, creative and innovative, active in communication and coordination, performing task sharing, task oriented and result oriented. All three domains cognitive, affective, and psychometric show significant improvements post-intervention, as supported by the T-test results. These findings demonstrate the overall effectiveness of the intervention strategies across different learning and performance areas. The comparisons between the incubator model used in various colleges today with the incubator model developed can be seen in the following Table 3.

Table 3. Current Incubator Model versus Developed Incubator Model

Step	**Phase**	**Current Incubator Model**	**Developed Incubator Model**
Analysis and Design	Pra Incubation	1) Socialization Program. 2) Participant recruitment. 3) Selection of proposals. 4) Announcement of selection results.	1) Socialization of the program. 2) Registration of participants (tenants) is mandatory for all participants in KWU courses through Google Form. 3) Pretest to assess the knowledge of KWU (cognitive) and attitude, soul, or mental entrepreneurship (affective). 4) Interview Test. 5) Formation of the Tenant Group.
Development	Incubation Process	1) Technical dictates and business management. 2) Internship. 3) Market Validation. 4) Phase I Market Test. 5) Product Revision. 6) Business sharing growth.	1) Technical dictates and business management. 2) Technical Training and Business Management Internship. 3) Mindset, Motivation, and Entrepreneurship. 4) Ideas and Opportunities. 5) Preparing a Business Plan. 6) Digital technology (E-commerce). 7) Organization and Business Management. 8) Development and Cooperation. 9) Posttest business process implementation.
Implementation	Implementation	1) Early production. 2) Market Test II. 3) Intellectual Property Rights (IPR). 4) Certification. 5) Standardization. 6) Business Agreement. 7) Coaching. 8) Mentoring. 9) Promotion. 10) Business Sharing. 11) Business Consulting. 12) Business Expo Expansion.	1) Production process. 2) Market Test. 3) Promotion (E-commerce). 4) Sales. 5) Standardization of product quality. 6) Coaching Mentoring. 7) Business Consultation. 8) Evaluation of business process enhancement.

Evaluation	Evaluation	1) Commercial production. 2) Market Expansion. 3) Business Matching. 4) Pitching business.	1) Increased Demand and Customer. 2) Sales Target. 3) Market Share. 4) Customer satisfaction.
	Post-Incubation for Alumni	1) Profitable. 2) Visible companies. 3) Economic development. 4) Job creation. 5) Industrial competitiveness. 6) Bankable. 7) Anchor tenant.	a) Expansion of the Market Territory. b) Product and Service Development. c) Quality of Products and Services. d) Using state-of-the-art technology. e) Network development. f) Financing and Access to Real Estate.

Table 3 explains the differences between the incubator model developed by the Ministry of Research, Technology, and Higher Education Indonesia, applied to the college, and models developed by researchers. In the pre-incubation phase, activities include the socialization of the program for the student business incubator competition, which opens once a year. The weakness is that not all students, especially those without business experience, are interested. The selection is based on proposal eligibility, including both new business proposals and those already running. The downside is that not all proposals are accepted due to limited funding.

The second phase of incubation involves guidance and support from accompanying lecturers through technical training, business management, and assistance with licenses, certification, and internships. Tenants execute their businesses, providing reports on performance. If successful, they are declared capable of developing their business independently, entering the product life cycle phases: Introduction, Growth, Maturity, and Decline.

The third stage is post-incubation, where tenants enter the independence phase. The incubator team evaluates the program and its implementation. Successful tenants are allowed to develop their businesses independently, with consultation available as needed. However, the model's weakness lies in the limited number of students who can participate due to competition for the annual grant funds of around 200-300 million, with 8 million allocated per proposal. This makes the incubator model ineffective in offering widespread training opportunities. Moreover, businesses aged 3-5 years remain vulnerable to risks, despite being considered successful in the incubator phase.

According to a survey by Statistic Brain conducted by Entrepreneur Weekly, the Small Business Development Center, Bradley Univ and the University of Tennessee Research in 2015, the number of start-ups or companies that start up and go through their first year of operation was only 75% or 25% bankrupt. In the second year, they survived 64% and in the third year only 56%. The advantages of the incubator model are as follows:

- Incubator participants are all students who are programming and attending entrepreneurship courses so that all students can become incubators as an attempt to divide the entrepreneurial soul and culture evenly in every student who programmes entrepreneurhood courses in every study program at a college.
- The technopreneurship incubator program serves as a compulsory laboratory to be followed by each student according to the program developed.
- Students as incubator participants are directed to become reliable Technopreneurship through the mastery and use of e-commerce technology as the main support in running their business processes. Starting and running a business often becomes a barrier for beginners, because they have to think from business ideas, strategic business location, means and opportunities, human resources, financing needs, gaining and enhancing customers. However, with e-commerce becoming simple, it is enough to create and use an e-commerce website or social media such as Facebook, Instagram and other social media.
- The concept of financing in the early stages of the incubation process is carried out independently by students adapted to the ability of the group. After the initial phase of the program succeeded, funding

assistance was provided through various programmes, including a grant fund, CSR from the partner industry, banking and a community grant fund for the well-being of the Indonesian people.

- Source of funding for the model developed:
  In the initial phase, the funding is a combined capital of the incubation participants according to the needs of the program they have planned under the guidance of the coach. After the project is in progress, a monthly, tri-monthly evaluation will be carried out of the implementation and achievement of the tenant implementation program as performance. At this stage, an assessment will be made of the mental or entrepreneurial changes of students based on the spirit of work and the level of access to the program. Groups that have shown significant growth in their business with the growth of spirit and spirit of entrepreneurship only become recipients of enterprise development assistance that comes from government grant assistance, the CSR industry, soft credit assistance from partner banking and from the community through the community grant fund program.
- The incubator management system and student enterprise development are carried out in three stages in the form of partnership with the following model:
  - Initial Stage of The Program
    - Recruitment of participants (all participants) must be incubator participants as a means of laboratory were doing entrepreneurial practices. Thus, all students have the same opportunity to cultivate their entrepreneurial spirit through construction and support in managing their business ideas creatively and innovatively.
    - Pre test and post-test and interview. This test aims to find out the motivation and competence of the participants both before and after the incubator program. From the results of the test, a training program that corresponds to the skill level becomes another base in development.
    - Provision of tenants with Entrepreneurial mindset, fostering the spirit of entrepreneur, business ideas and opportunities, how to start a business, market analysis and marketing, business management and organization, Human Resource Management (MSDM) as well as financial management, use of production technology and mastery and use of Internet-based Information and Computer Technology (ICT).
    - Forming business groups according to their respective interests
    - Preparing a business plan according to the material given in the training
  - The Second Stage of the Implementation Program
    - Implementation of the effort. In the development of this enterprise, they are guided by mentors (accompanying lecturers) on how to manage the supply of raw materials, production processes, service system (for service products), promotion and marketing as well as how to administer finance.
    - Use of digital technology based on e-commerce. Through the use of e-commerce technology business processes can be done easily and quickly such as product introduction, transaction processes and distribution services can be made online, so it is widely accessible. Besides easy and broad access in terms of capital requirements, investment and operating capital are also cheaper. Students don't have to prepare offices or shops and all the supplies that cost tens of millions to hundreds of millions. As a start-up entrepreneur, you can start a business simply by settig up an application in the form of websites, Instagram, facebook, and other social media or joining marketplaces that are already available such as Lazada, Shopee, Open Store and so on as well as cooperation with the owners of products.
    - Sustainable liquid construction and support. The program of building and supporting the tenant business continuously aims to ensure that the spirit and mental efforts of the tenants continue to strengthen as well as the business processes carried out can run and thrive well.
    - Availability of the program to carry out controls when there are less effective results and to develop what has been achieved. Evaluation of tenant performance. All planned programmes are evaluated periodically to determine the level. The incubator business in university must be supported by governemt [39, 40].

Table 4. Indonesia versus Malaysia, Singapore, and Thailand Model

Aspect	Indonesia	Malaysia	Singapore	Thailand
Government Program	- 1000 Digital Startup Movement - Bekraf (Creative Economy Agency) - BRIN Innovation Center	- Malaysia Digital Economy Corporation (MDEC) - Cradle Fund - Malaysian Global Innovation & Creativity Centre (MaGIC)	- Startup SG - Enterprise Singapore - Singapore Digital	- Startup Thailand - Digital Economy Promotion Agency (DEPA) - True Digital Park
Digital Infrastructure	- Internet penetration: 73.7% - Infrastructure development is still uneven - Palapa Ring Project for national connectivity	- Internet penetration: 84.2% - MSC Malaysia (Multimedia Corridor) - Developing 5G infrastructure	- Internet penetration: 88.4% - Smart Nation Initiative - The best digital infrastructure in Southeast Asia	- Internet penetration: 77.8% - Thailand 4.0 Digital Infrastructure - Active 5G development
Funding	- Local and international Venture Capital - Crowdfunding platforms - Angel Investor Networks	- Malaysian Venture Capital Management (MAVCAP) - Government matching funds - Islamic financing options	- Temasek Holdings - Enterprise Singapore Startup Grants - Robust VC ecosystem	- Corporate Venture Capital - Government Savings Bank Startup Fund - SME Development Fund
Startup Ecosystem	- Jakarta as a hub - Communities of evolving startups in big cities - Focus on e-commerce and fintech	- Cyberjaya as a technology hub - Focus on Islamic fintech - Strong university-industry collaboration	- Global startup hub - Focus on deep tech - Mature ecosystem with global talent	- Bangkok as a major hub - Focus on retail tech and fintech - Large corporate support
Mentors and Experts	- Limited experienced mentors - The mentoring program is still developing - Limited tech diaspora network	- Structured mentoring program - Collaboration with international mentors - Strong professional network	- High quality global mentors - Access to international professional networks - Expert-in-residence programs	- Mentorship from regional mentors - Strong regional mentoring program support
Regulation	- Omnibus Law supports startups - Evolving fintech regulations - Data protection is still under development - Large domestic market	- Digital Investment Office - Regulatory sandbox for fintech - Digital banking framework	- Mature regulatory sandbox - Pro-business policies - Strong IP protection	- Startup Act - Eastern Economic Corridor (EEC) - Smart Visa program

Competitive Advantage	- Competitive advantage: - Strategic location - Infrastructure gaps - Uneven regional talent distribution - Access to funding is still limited	- Halal tech hub - Strategic location - Strong government support	- Global financial hub - International talent pool - World-class infrastructure	- Manufacturing hub - Gateway to Indochina - Strong creative industries
Challenges	- Infrastructure gap between regions - Unequal distribution of talent - Access to funding is still limited	- Dependence on foreign talent - Limited market size - Brain drain	- High operational costs - Tight talent competition - Small domestic market	- International language gap - Dependence on domestic market - Political stability

This Table 4 summarizes the strengths, challenges, and unique characteristics of startup ecosystems in Indonesia, Malaysia, Singapore, and Thailand, providing insights into their contributions to fostering innovation and economic growth in Southeast Asia.

3.3.3. Phase Three of The Development Program

At this stage, after an evaluation of the availability of the incubator program where the results of incubation implementation have been successfully carried out. the growth of entrepreneurial spirit and spirit as well as the increased knowledge and technical skills and business management skills of tenants, then the next programme is the development and continuous support of tenant enterprises with the partnership system to accelerate the expansion of markets, networks, and access to financing. This is done to accelerate the growth and development of partnerships which in turn can open up employment opportunities. Thus, the start-ups built in this partnership can grow and thrive which can contribute to the improvement of the well-being of the community and the economic progress of the nation. Table 3 shows the different step and model activities between the current incubator and the designed incubator model.

- Program Success Indicators
  The success of an incubator is measured by the growth in knowledge, entrepreneurial spirit, and skills of the tenants, as well as their ability to follow the incubator program. Indicators of program success include tenant activity, business plan development skills, and competence in using e-commerce for marketing, promotions, and transactions. Achieving this depends on four factors: the entrepreneur skills and preparedness, the organization capability to handle challenges, lack of support mechanisms from relevant institutions, and the rapidly changing business environment in terms of technology and competition [41]. The environment is crucial for incubator development, as noted by [42], with various environmental factors influencing the entrepreneurial university model and programs. These factors are also shaped by the institution organizational structure, management policies, and priorities [43].

- Development of Tenant Business with a Partnership System
  In the development phase of the tenant enterprise, further cooperation will be carried out in the form of a partnership enterprise with a system of fee percentages between the tenants and PIPUM-FT UIS. The concept of partnership is that the tenant as a partner will still get construction and support in the development of the enterprise in all aspects such as market expansion, promotion, production, network development, access to funding of technology support and so on. In principle, this PIPUM institution will serve to help tenants accelerate the growth and development of partners. This partnership system can eliminate the fear of the students about the risks that may arise in starting and developing its enterprise because there is the backup and direct support given by PIPUM with this system the enterprise partner institution of this community will also grow well thanks to the support of the spirit and progress of its business partners. A partnership is understood as a business strategy carried out by both parties or more within a certain period to obtain profits along with the principle of mutual need and mutual nurturing. The objectives of the Partnership Entrepreneurship, among others, are as follows:

- To increase revenue and business continuity
- Improve the quality of the resources of the partner group
- Increasing the scale of the business to grow and enhance the business capacity of the partner group

Participation in programs is significantly and favorably correlated with entrepreneurial involvement [44], suggesting that entrepreneurship education encourages students to act as entrepreneurs [45]. Comparably, study by [46] shown effective results when it came to providing educational resources, particularly with regard to curriculum-outlined phases of the invention and technology transfer processes that quicken the commercialization of technology.

The Table 5 outlines how various entrepreneurial sectors integrate digital models to innovate and address challenges, providing examples and reliable references for further study.

Table 5. The Table Outlines How Various Entrepreneurial Sectors are Applied in Different Contexts

Sector	**Model Application**	**Example**	**Citation**
Agripreneurship	Optimize agricultural supply chains, improve market access for smallholder farmers, promote sustainability	Predictive analytics for anticipating crop yields based on weather and soil data, reducing waste. Digital platforms connecting farmers directly to consumers, ensuring fair prices.	[47]
Fashionpreneurship	Aid in trend forecasting, inventory management, and ethical material sourcing	AI-driven fashion recommendation engines for curated collections, boosting sales conversions. Blockchain for tracking supply chains to ensure transparency and ethical sourcing.	[48]
Edupreneurship	Support innovative educational initiatives, content delivery, and personalized learning experiences	Platforms offering AI-based customized learning paths tailored to student progress. Virtual reality (VR) for immersive learning in fields like medical training or engineering.	[49]
Healthpreneurship	Facilitate healthcare innovation, patient engagement, and data-driven decision-making	Telemedicine with AI diagnostics for remote consultations and early disease detection. Wearable tech for monitoring vitals and predicting health risks.	[50]
Greenpreneurship	Drive sustainability through renewable energy, waste management, and eco-friendly innovations	IoT and AI solutions for optimizing energy consumption, reducing carbon footprints. Circular economy platforms for material reuse and innovative recycling solutions.	[51]
Social Entrepreneurship	Address societal issues with scalable, impactful solutions	Platforms linking underserved communities with skill development and job opportunities. Microfinance leveraging predictive analytics for credit assessments to expand financial inclusion.	[52]

A deeper exploration of the challenges encountered during the implementation of the incubator model would offer a more balanced perspective, particularly in addressing issues of scalability and the influence of external factors [53]. For instance, incubators often face difficulties in scaling their operations due to limited resources, inconsistent funding, and variations in local infrastructure. External factors such as regulatory hurdles, market volatility, and cultural resistance to entrepreneurial risk-taking can further affect the outcomes of incubator programs. By analyzing these challenges, the discussion can provide insights into potential strategies to overcome barriers and enhance the effectiveness of incubator models in diverse contexts.

In Indonesia, the relationship between the outcomes of the incubator model and national or regional economic development can provide valuable insights into economic policy discussions. Incubators in Indonesia, such as Bekraf Creative Incubator and Startup Indonesia, play a pivotal role in fostering entrepreneurial ecosystems by offering startups access to resources, mentorship, and funding. These initiatives have contributed to job creation, stimulated innovation in sectors like fintech and agriculture, and enhanced the competitiveness of Indonesia growing digital economy [54].

Additionally, Indonesia's incubators address regional disparities by nurturing localized solutions to specific economic challenges [55]. For example, incubator programs have supported rural entrepreneurs in adopting technology to improve agricultural productivity and facilitated skill development for underserved communities in remote areas. These efforts align with Indonesia broader economic goals, such as reducing unemployment and promoting equitable regional development [56, 57].

By emphasizing the outcomes of these incubator initiatives, policymakers in Indonesia can design targeted interventions that not only scale entrepreneurial success but also contribute to sustainable national economic growth. This alignment between incubator activities and economic policies underscores the strategic importance of fostering an innovation-driven economy in Indonesia.

4. MANAGERIAL IMPLICATIONS

The findings of the study underscore the critical importance of developing practical and effective technopreneurship incubator models tailored to the digitalization era. Managers and policymakers should prioritize creating incubators that offer tailored support systems, including mentorship, funding access, and structured training programs that align with the specific needs of startups across various sectors. The demonstrated effectiveness of e-commerce driven business processes in improving cognitive, affective, and psychomotor domains suggests that integrating digital tools and platforms into incubator programs can significantly enhance entrepreneurial readiness and business outcomes. Moreover, fostering strategic partnerships with universities, corporations, and government entities can expand access to resources, networks, and innovation opportunities, ensuring the scalability and long-term sustainability of incubator initiatives. These strategies can address existing gaps, such as regional disparities in infrastructure and funding access, while promoting equitable economic development and cultivating a robust entrepreneurial ecosystem.

5. CONCLUSION

The designed model demonstrated significant practical value in its application. The practicality assessment of the model designed using the Total Response Rate (TCR) showed a result of 89.2%, which falls into the very practical category. Design and implementation process was acceptable. Empirical results validate the model's effectiveness in achieving its objectives. Based on the pretest and post-test assessments, the average score in the cognitive category of the pretest was 78.90 and the post-test was 85.50. The deployment of the model has led to tangible benefits, including efficiency gains, improved satisfaction among end-users, ease of use, and motivation of startups. The benefits of partnership activities are joint efforts to strengthen competitiveness and to build a strong enterprise world order with the backbone of a robust medium enterprise, supporting each other with small and medium enterprises or large enterprises, or building a healthy business order between managers and capital owners through cooperative bonds. Its scalability ensures that it can be adapted to various contexts, amplifying its impact across different sectors. The model represents a significant advancement in its field, providing a practical and effective model for addressing the challenges it was designed to overcome. In conclusion, the model's practicality and effectiveness have been thoroughly demonstrated through both qualitative and quantitative measures, making it a valuable asset for its intended application.

6. DECLARATIONS

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6.2. Author Contributions

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

6.3. Data Availability Statement

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

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6.5. Declaration of Conflicting Interest

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

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