THESIS OF THE DOCTORAL (PhD) DISSERTATION

SUSTAINABLE START-UP INCUBATION: AN INDONESIAN CASE

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1. INTRODUCTION OF THE TOPICS AND OBJECTIVES

Start-up is the practical activity of starting a business in an uncertain environment (Wang et al. 2022). Start-ups introduce new products and services, create jobs and customer value, improve living standards, and resolve global challenges (Aldrich and Ruef 2012; Fini et al. 2018). Through creative destruction (Schumpeter 2017), start-up firms play a critical role in developing the economy and society. The development of start-ups incorporates the idea of corporate sustainability. Corporate Sustainability (CS) is now a critical link in the causal chain connecting business success to the economic, environmental, and social dimensions. By balancing economic health (the economy), social equality (the people), and environmental resilience (the planet), sustainable entrepreneurs attempt to manage the "triple bottom line" (Kuckertz and Wagner 2010).

However, starting a business does not happen in a vacuum. Innovative companies continually make use of their available resources, interact with other people, firms and exchange goods and services (Gnyawali and Fogel 1994; Spigel and Harrison 2017; Spilling 1996; Van De Ven 1993), interacting closely with their surrounding settings (Szerb et al. 2019). Start-up Incubation Ecosystems (SUPIEs) are a collection of interconnected actors and variables that work together to create a supportive environment for start-up formation and successful development (Novotny et al. 2020). The SUPIE idea highlights how ecosystems play a significant role in forming new businesses during their early stages, which has long-term effects on their ability to survive and expand (Beckman and Burton 2008).

University students start an essential share of innovative start-ups; (Eesley and Miller 2018; Roberts and Eesley 2011), who are mostly novice (inexperienced) entrepreneurs. While there is a considerable volume of literature addressing the processes of e.g., patenting, licensing, and the establishment of firms initiated by university faculties, there exists a notable lack of comprehensive data and insights concerning the inception and growth of start-ups founded by students. As student interest in entrepreneurship continues to rise, universities and policymakers across the globe are actively developing and implementing a diverse array of support mechanisms and initiatives. These efforts aim to facilitate entrepreneurial skill development, provide access to funding, foster mentorship opportunities, and create ecosystems that nurture innovative ideas, thereby empowering

students to transform their entrepreneurial aspirations into viable business ventures. These measures include entrepreneurship education, university incubators and accelerators offering students access to office space and labs, technology transfer and business development services (Breznitz and Feldman 2010). Entrepreneurship education is defined broadly, as it equips students with knowledge and competencies on how to start a new firm and develops their ambitious spirit and innovation skills that they can utilize as employees of larger organizations (Gibb 2002). Both international findings emphasize that entrepreneurial education is a crucial factor of entrepreneurship ecosystems and a key determinant of start-up success (Belitski and Heron 2017; Csákné Filep, Radácsi, and Timár 2020; Kuti and Bedő 2018; S. Gubik 2013). Despite the increasing resources devoted to inspiring students to start a firm at the national and university levels, there needs to be more knowledge on how various support mechanisms should be implemented to facilitate the birth and growth of student start-ups (Thompson 2013). Very few studies focus on incubating student start-ups from an ecosystem point of view (Wright, Siegel, and Mustar 2017). What specific improvements are needed in frameworks for developing student start-ups in resource-scarce contexts? What metrics or criteria can be used to measure the effectiveness of these frameworks in emerging regions?

Indonesia is the fourth most populous emerging country in the world according to the World Bank as of 2022, with a population of 275 million people. As the country with the largest market size in Southeast Asia, Indonesia benefits from a majority young, internet-savvy workforce, creating leading start-ups and unicorns. According to the GUESS National Report (2021), a significant number of Indonesian students express a desire to become employees (49.79%) or business founders (31.48%) after completing their studies. However, five years post-graduation, this preference shifts, with 31.48% aspiring to be employees and 60.29% aiming to be business founders. Notably, the interest in pursuing careers as business successors remains low, at approximately 3.5% (Suhartanto 2021).

While most start-ups in Indonesia are digital-focused, the unicorn companies span a diverse range of industries, including logistics, travel, ticketing, and financial technology services. Unicorns are defined as start-up companies with a valuation of $1 billion, while decacorns are those valued at $10 billion. Currently, Indonesia is home to eight unicorns and two decacorns: GoTo Group and J&T Express. Notably, GoTo Group is set to launch its initial

public offering (IPO) in 2022. The first five Indonesian e-commerce platforms to obtain unicorn status are Gojek, Tokopedia, Traveloka, Bukalapak, and OVO. As of 2022, Indonesia ranks among the top seven countries in the Asia-Pacific region for producing unicorn start-ups, following China, India, South Korea, Singapore, Australia, and Japan (Figure 1).

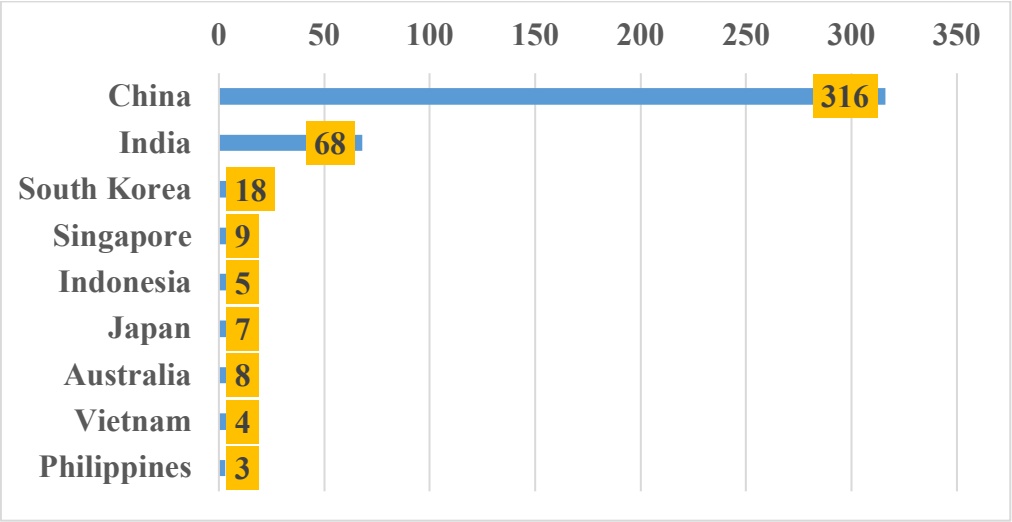

Figure 1: Number of Unicorns in Asia-Pacific as of 2022, by Countries

Source: (Statista 2024)

Indonesia's start-up ecosystem ranked 41st globally and 2nd in Southeast Asia (Statista 2024). In addition, Figure 2 shows the leading start-ups in Indonesia as of January 2024 by total funding amount (in million U.S. dollars).

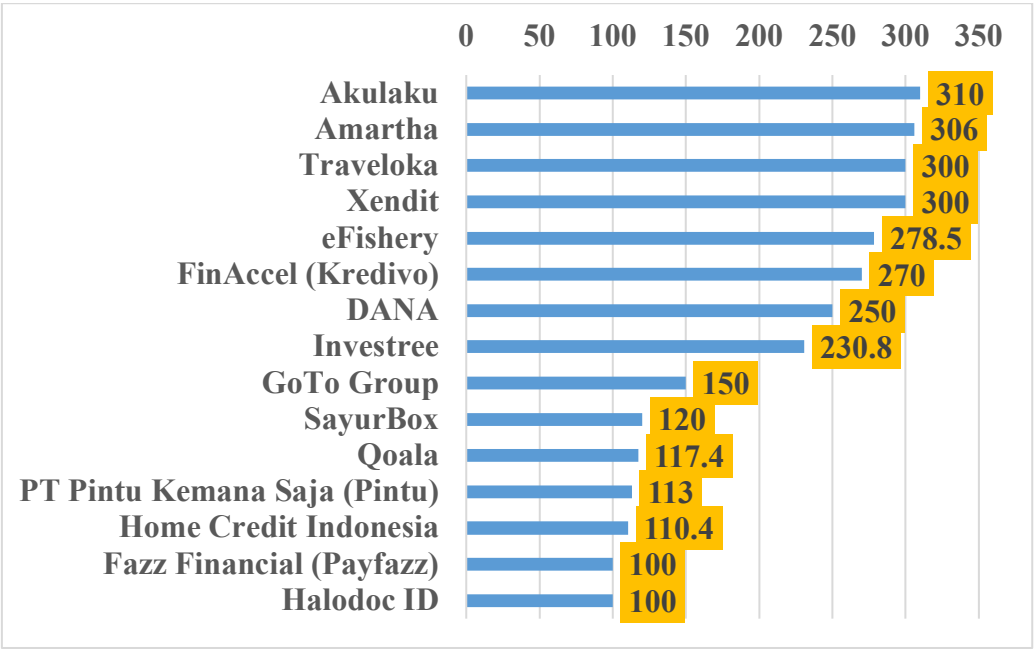

Figure 2: Leading Start-ups in Indonesia 2024 by Fundings

Source: (Statista 2024)

Table 1 presents the 2023 rankings of the startup ecosystem across various cities in Indonesia, highlighting their relative positions on the global stage. In 2023, Indonesia's capital city, Jakarta, ranked 29 regarding its startup ecosystem. Other cities such as Bandung, Denpasar, Yogyakarta, and Surabaya have successively ranked 386, 874, 931, and 938 globally, indicating that the start-up ecosystem is conducive to Indonesia.

Table 1: Start-up Ecosystem Ranking in Indonesia 2023 by Cities

City	Global ranking out of 1,000 cities
Jakarta	29
Bandung	386
Denpasar	874
Yogyakarta	931
Surabaya	938

Source: (Statista 2024)

As of January 2024, Greater Jakarta, also known as the Jakarta metropolitan area, had around 539 start-ups, making it the area in Indonesia with the highest number of start-ups (Figure 3). Jakarta serves as the economic hub of Indonesia, and in 2023, it ranked 29th among 1,000 cities globally for its vibrant start-up ecosystem. Followed by Bandung, Yogyakarta, Denpasar, Surabaya, Medan, Semarang, and Pandeglang, respectively.

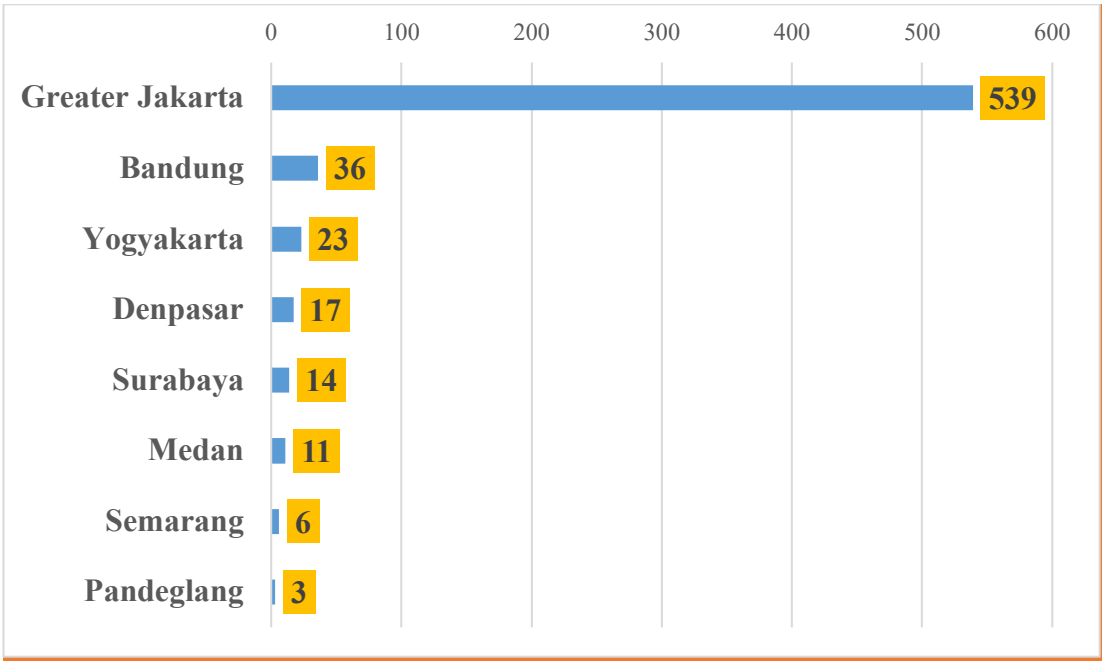

Figure 3: Number of Startups in Indonesia 2024, by Cities

Source: (Statista 2024)

In the 2023 Global Startup Environment Index, Jakarta is ranked 10th in Asia Pacific and the top 30 globally as the city with the most developed start-up ecosystem. Jakarta's standing in this index differs from other cities in Indonesia. Several cities in Indonesia have the potential to create a welcoming atmosphere for businesses. Denpasar, Bali Province, is one of them.

Recent years have seen a substantial surge in the growth of start-ups in Indonesia, including in Bali Province. This phenomenon is inseparable from the development of digital technology, changes in consumer preferences, and government support through various incubation and business acceleration programs. Despite this growth, the sustainability of many start-ups remains a substantial challenge. A substantial proportion of these nascent enterprises face the prospect of insolvency due to their inability to adapt dynamic business environment, to address market demands, or to manage resources efficiently (Vincent and Zakkariya 2021).

Bali Province, renowned as a global tourism destination, possesses distinctive potential for the cultivation of sustainable start-ups. Three main factors drive this potential. Firstly, there is a global trend towards a green economy. Secondly, there is a demand for environmentally friendly solutions. Thirdly, there is a local Balinese culture that emphasizes harmony with nature. However, in practice, many start-ups in Bali have not fully utilized sustainability principles in their business models. Moreover, existing incubation programs frequently lack

integration with sustainability aspects, resulting in inadequate guidance for start-ups to incorporate Environmental, Social, and Governance (ESG) principles into their operations. However, research on sustainable start-up incubation remains scarce, particularly in regions such as Bali Province. The extant research in this area predominantly emphasizes the technical dimensions of incubation, neglecting the broader integration of sustainability principles (Vincent and Zakkariya 2021; Vinney Zephaniah Vincent and Zakkariya 2021). Indeed, sustainability is not merely a social responsibility, however, it is also a critical factor in establishing long-term competitive advantage for start-ups. Hence, there is a necessity to investigate the way incubators in Bali can be designed and operated to support sustainable start-up development.

Objectives of the Research

This thesis is focused on the evaluation of university business incubators that support student start-ups, specifically examining these incubators through the lens of sustaining a mission rooted in sustainability. The research comprises three distinct sections. The first session is a bibliometric analysis and visualization of start-up incubation. The second one is focused on the profile of university business incubators that carry out the start-up incubation process. The third part of this research analyzes the performance of start-ups resulting from incubation at university business incubators.

Moreover, the results of this study are also expected to investigate the environments (elements and layers of SUPIEs) in which student start-ups are created and supported before their birth (hatching), as well as during their early development, and identify the critical environmental components that influence the birth, survival, and growth of student firms, this research adopts an ecosystems perspective. This analysis will explore the functioning of student ecosystems, specifically focusing on the interactions among individuals, organizations, and various elements within the ecosystem that contribute to the growth of successful student start-ups. The detailed objectives are as follows:

1. This study focuses on the development of a bibliometric analysis and visualization of start-up incubation. We have reviewed the literature concerning the interconnectedness of research streams related to start-ups and incubation.

2. The exploration of the role of business incubators in supporting start-ups will include factors such as access to resources and mentorship.
3. Additionally, we will examine the limitations of these programs, particularly their tendency to favor short-term success over sustainability. In this regard, the research will emphasize sustainable practices, e.g., environmentally friendly initiatives and business strategies, to address challenges faced by start-ups.
4. The primary objective of thesis is to identify future applications and models that can lead to recommendations for sustainable practices at Indonesian universities, aimed at enhancing existing business ecosystem processes and support mechanisms. This includes the concept of Sustainability-driven Business Incubations (SBIs) for the establishment of student ventures.
5. By integrating insights from various research fields and adopting a multidimensional perspective, this thesis advocates for employing innovative data and methodologies to gain a deeper understanding of the incubation process and its broader socio-economic impacts.

2. MATERIALS AND METHODS OF THE THESIS

2.1 Research Approach

This research employs a quantitative approach to investigate the phenomenon of sustainable start-up incubation. The quantitative approach was chosen because the research aims to collect numerical data that can be measured and analyzed statistically, providing an objective perspective on how business incubators support start-up sustainability. Creswell & Creswell (2018) that the quantitative methodology is appropriate when researchers aim to empirically test hypotheses or systematically characterize distinct phenomena through structured data-gathering techniques. In this study, we employed a structured survey methodology to gather data focusing on incubation practices and the range of services offered to start-ups. The objective was to assess the correlation between these services and their influence on the sustainability of new ventures. The data that was thus generated was then subjected to analysis using statistical techniques such as quantitative descriptive analysis, with the objective of providing a comprehensive insight into the state of business incubators in supporting sustainable start-ups. Another statistical approach that can be utilized is structural equation modeling (SEM) analysis. SEM is a sophisticated statistical

technique designed to explore the relationships between variables within complex models (Becker, Ringle, and Sarstedt 2018; Hair, Hult, and Christian M. and Sarstedt 2017).

This method is particularly valuable in research focusing on the interplay between the sustainable start-up ecosystem and the entrepreneurial process, which includes stages such as idea generation, prototype development, validation, as well as production and commercialization.

2.2 Research Design of the Thesis

In order to achieve the study's objectives Figure 4 is illustrated. The research will be conducted in three stages. Initially, a literature review will be conducted using bibliometric data to gather literature relevant to the research objectives. Following this objective, two surveys will be administered, utilizing a structured questionnaire as the tool. The follow-up survey (Part 1) will focus on all university business incubators in Bali Province, Indonesia, with the aim of obtaining and analyzing the profile of the business incubators. The subsequent survey will target all start-ups currently or previously incubated in each university business incubator in Bali Province. The goal of the second survey (Part 2) is to gather a comprehensive profile and evaluate the performance of these start-ups.

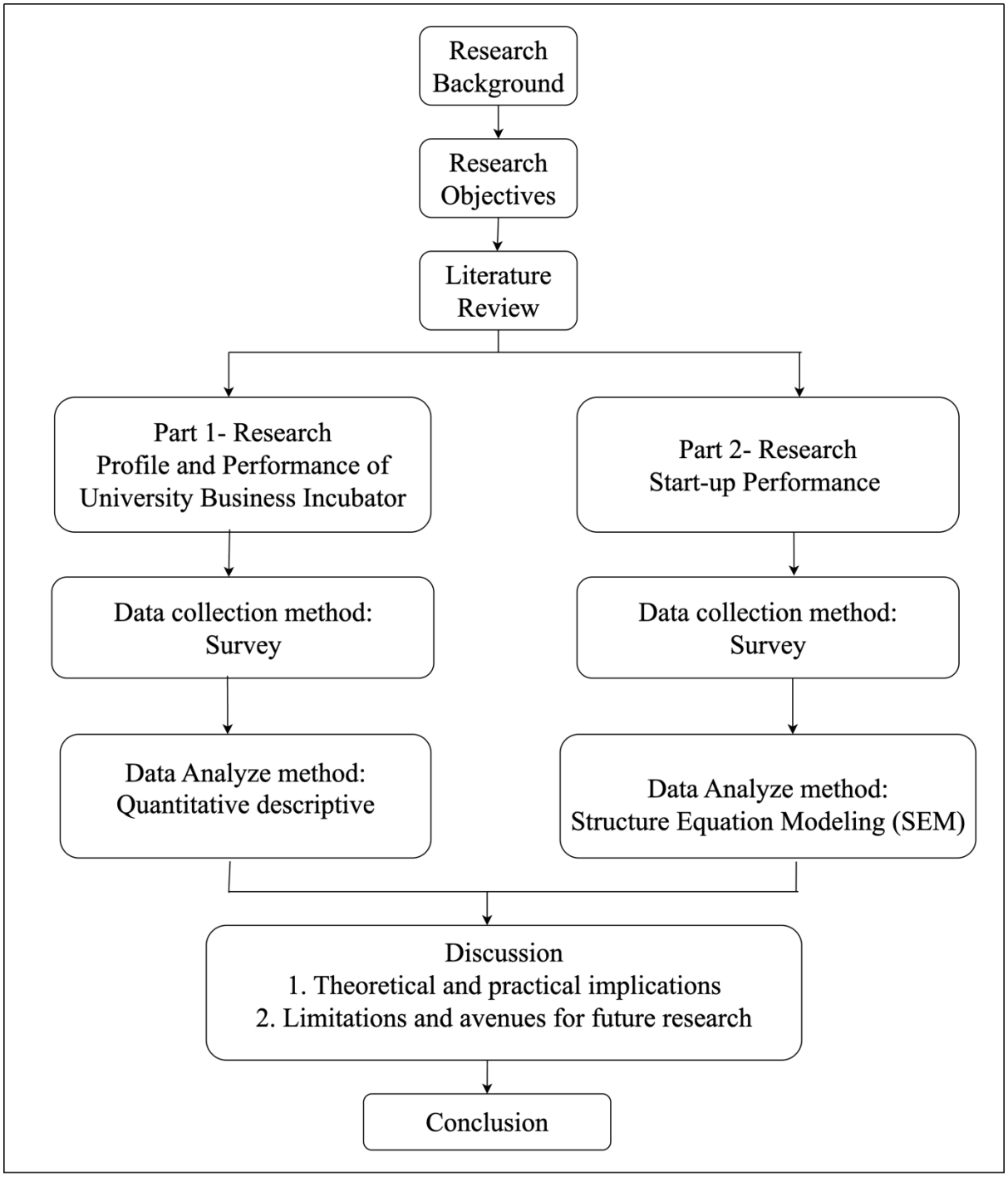

Figure 4: Research Design of The Thesis

Source: author's compilation (2025)

2.3. Conceptual Frameworks of the Research

2.3.1 Research Part 1

In the following, we present the framework of the survey, as shown in Figure 5. As part of this work, the following research activities have been conducted such as literature review on university business incubators, development of survey questions and survey distribution

to existing university business incubators in Bali Province, Indonesia. These activities are presented in the following statement, as they will be reported in the next part of this research.

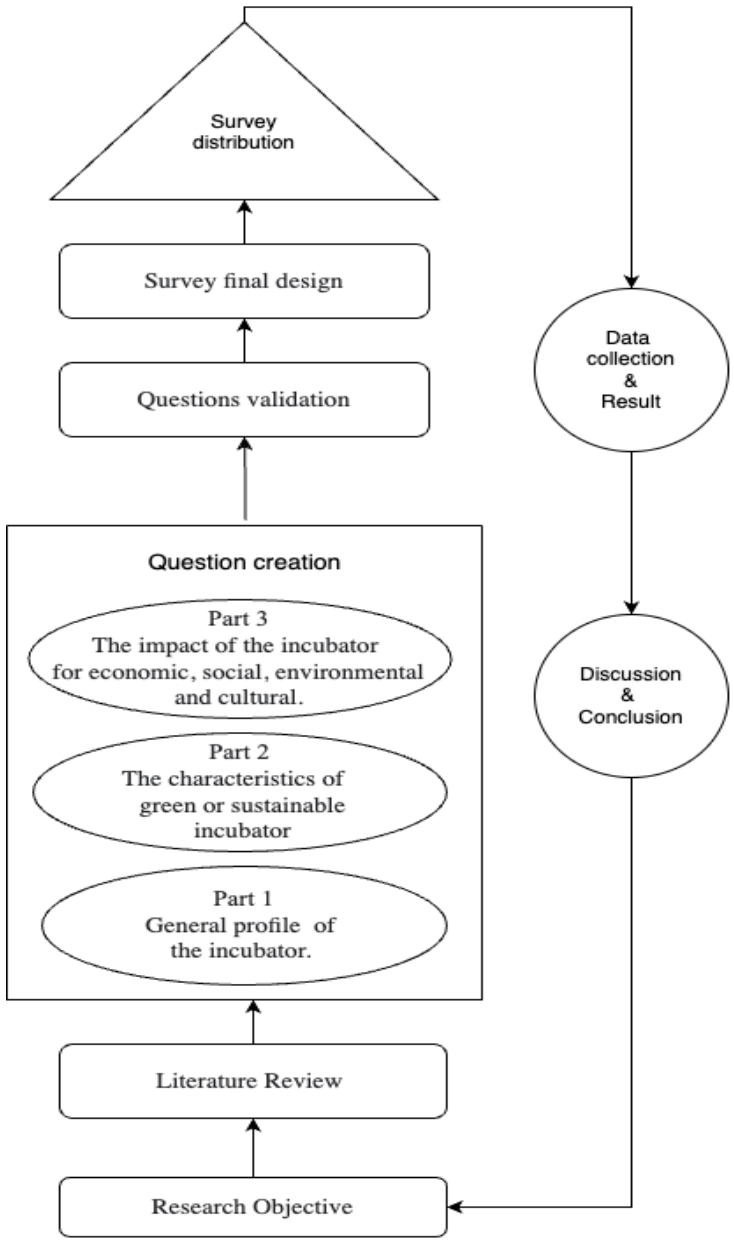

Figure 5: Survey Framework of the Research Part 1

Source: author's compilation (2025)

2.3.2. Research Part 2

Drawing upon the theoretical background discussed above, the following conceptual framework is proposed and illustrated in Figure 6. The conceptual framework is a foundation for understanding the relationships between the sustainable entrepreneurial ecosystem, the sustainable entrepreneurial process, and production and commercialization.

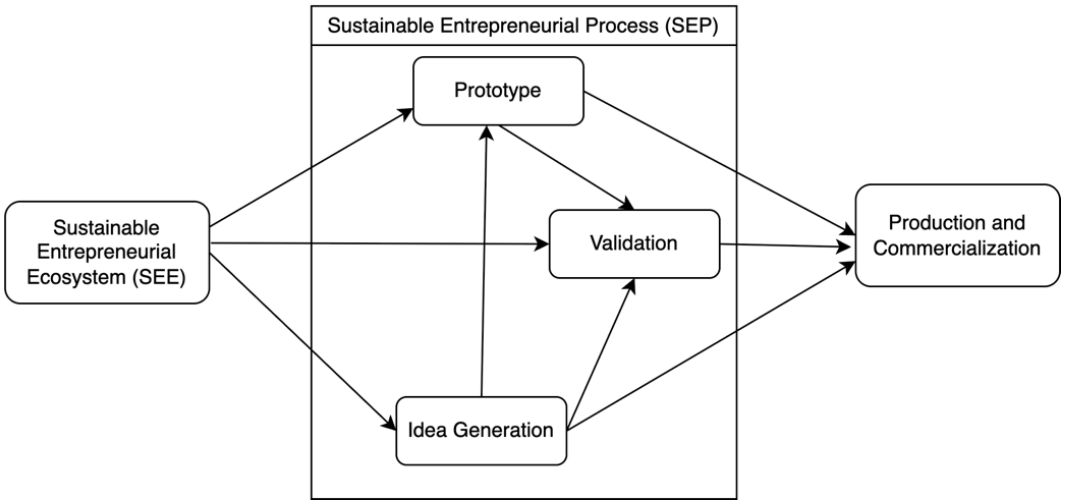

Figure 6: Proposed Conceptual Framework

Source: author's compilation (2025)

In light of the findings from the literature review and the proposed conceptual framework, the subsequent hypothesis was formulated:

- H1: Sustainable Entrepreneurial Ecosystem (SEE) positively and significantly impacts on a Sustainable Entrepreneurial Process (SEP).
- H1a: Sustainable Entrepreneurial Ecosystem (SEE) positively and significantly impacts on idea generation.
- H1b: Sustainable Entrepreneurial Ecosystem (SEE) positively and significantly impacts on prototype.
- H1c: Sustainable Entrepreneurial Ecosystem (SEE) positively and significantly impacts on validation.
- H2: Sustainable Entrepreneurial Process (SEP) positively and significantly impacts on production and commercialization.
- H2a: Idea generation positively and significantly impacts on production and commercialization.
- H2b: Prototype positively and significantly impacts on production and commercialization.
- H2c: Validation positively and significantly impacts on production and commercialization.

- H3: Sustainable Entrepreneurial Process mediates the effect of the Sustainable Entrepreneurial Ecosystem (SEE) on production and commercialization.

2.4 The Timeframe and Geographical Scope of the Research

The initial survey was conducted among all university business incubators in Bali Province, Indonesia, with the purpose of obtaining and analyzing their profiles. According to data from the Association of Indonesian Business Incubators (AIBI), there are currently 14 university business incubators in Bali Province. The implementation of a survey and the distribution of questionnaires will take place from 2023 to 2025 and will be divided into two separate surveys.

2.5 Sample Frame and Population

2.5.1 Research Part 1

The population for Part 1 of the study comprised all university business incubators in Bali Province. The sampling technique employed in this research utilized a census approach, which is a data collection method where the entire population serves as the subject of investigation or survey. The total research sample consisted of 14 higher education business incubators located in Bali Province. The respondents responsible for completing the questionnaire in this study were managerial staff or employees affiliated with the university business incubators.

2.5.2 Research Part 2

The population for the research part 2 includes all start-up tenants who have been incubated or are currently being incubated by university business incubators in Bali Province. The total population based on the results of data mining in part 1 of the research survey was 487 tenant start-ups. Using this particular calculation method (Soper DS 2025), an online calculator was employed to determine the minimum sample size. The online calculator technique is relevant (Cohen 1992; Westland 2010). There are two lower bounds for determining sample size in Structural Equation Modeling (SEM). The first is based on the ratio of observed (indicator) variables to latent variables, while the second depends on the minimum effect size, statistical power, and significance level.

2.6 Data Collection Methods

The research employs the survey method, a recognized primary data collection technique. The survey was conducted using Google Forms, an online platform that enables the efficient distribution of questionnaires. The study focused on university business incubators, with surveys sent via email to these entities.

2.7 Data Analysis Methods

The data analysis methods utilized in this thesis can be classified into two distinct categories, as outlined below:

2.7.1 Research Part 1

Quantitative descriptive analysis aims to present a quantitative report on the profile of sustainable business incubators based on survey results. Quantitative descriptive analysis is a statistical method utilized to describe the characteristics of data numerically and systematically (Creswell and Creswell 2018). This approach aims to provide a concise description or summary of the collected data without engaging in hypothesis testing or statistical inference (Luthan et al. 2024). Quantitative descriptive analysis is frequently employed in preliminary research to explore patterns, trends, and data distributions, thereby offering a foundational understanding of the phenomenon under investigation.

2.7.2 Research Part 2

A Structural Equation Modeling (SEM) analysis was performed. SEM is a statistical technique employed to examine the relationships among variables within complex models (Becker et al. 2018). In this study, a reflective model is utilized, in which indicators (observed variables) are influenced by latent constructs (Hair et al. 2017). Essentially, the latent variable serves as the underlying cause of the indicators, which are regarded as manifestations or reflections of the latent construct. This model assumes that changes in the latent variable directly affect the observed indicators, thereby establishing a causal relationship from the latent construct to its corresponding indicators. The constructs analyzed in this study were assessed using SmartPLS 4.0, a software program designed to evaluate the proposed model. The study consists of two analytical stages: the measurement model test and the structural model test.

3. MAIN FINDINGS OF THE DISSERTATION

3.1 Research Part 1: University Business Incubator Profile and Performance

3.1.1 Profile of The Respondent (University Business Incubators)

The results of the survey are presented in the following table. The respondent data from universities willing to complete the questionnaire (Table 2). Business incubators were established at different times from 1998 to 2023. In addition, of the 14 respondents who completed the online survey, their position in the incubator was as head of the business incubator for 11 respondents (78.6%) and as staff for 3 respondents (21.4%).

Table 2: Data of the Respondents

No	Institutions	The year of incubator established
1	Universitas Hindu Indonesia	2017
2	Universitas PGRI Mahadewa Indonesia	2013
3	Universitas Warmadewa	2017
4	Universitas Pendidikan Nasional	2018
5	Universitas Mahasaraswati Denpasar	1998
6	Institut Bisnis dan Teknologi Indonesia	2016
7	Universitas Primakara	2014
8	Bali Tourism Polytechnic	2019
9	Universitas Ngurah Rai	2015
10	Institute of Technology and Business STIKOM Bali	2014
11	Universitas Pendidikan Ganesha	2018
12	Universitas Triatma Mulya	2023
13	Politeknik Negeri Bali	2021
14	Universitas Udayana	2016

Source: author's collection (2025)

3.1.2 Main Findings of Research Part 1

Research Part 1 aims to assess the effectiveness and potential of incubator support systems in developing sustainable start-ups. Additionally, the survey analysis explored the identification and transfer of best practices0. Drawing from the findings conducted among all UBIs in Bali Province, Indonesia, as detailed in the results above section draw the following conclusions:

- In Bali Province, Indonesia, UBIs are primarily owned by universities, with minor ownership from private investors and others.
- These incubators offer clients training through seminars and workshops and coaching in management, accounting, finance, and marketing.
- Incubators focus on industries or knowledge fields such as culture, creative industries, and arts, followed by information technology, software, big data, artificial intelligence (AI), telecommunications, cleantech, Greentech, renewable energy, environmental services, biotechnology, and life sciences. Incubators may also cater to all industries or those falling under miscellaneous or manufacturing and fintech categories.
- On average, start-ups spend 1-2 years in incubators. It is due to various factors, including limited incubator space and the need to accept new tenants yearly as per the curriculum. Additionally, tenants must complete government start-up incubation program grants through universities within a specific timeframe, contributing to this duration.
- UBIs have observed a positive trend in annual budget changes over the past three years (2021-2023). Despite the growth, many incubators continue to depend on income generated through their operations. Further research reveals that their average income remains below IDR 100 million and within the range of IDR 101-500 million.
- In the last 3 years (2021-2023), 487 start-ups/spin-offs were founded at UBIs. Of these, 115 start-ups have been sold to investors or other companies. Thus, Green, sustainable, or environmentally friendly products/services are the core business of all university business incubators. Most start-ups focus on providing economic benefits, with only 11.3% offering sustainable/societal benefits.

- The number of employees in university start-ups varies depending on the size of the incubator and the number of start-ups. Most employees do not have salaries tied to performance.
- UBIs prioritize social and environmental impacts and economic development. They have a clear vision of sustainable development goals (SDGs) and significantly contribute to regional/national and economic development.
- Incubators actively support tenants in achieving specific goals and reducing negative environmental and social impacts. The survey results showed that they have implemented proactive measures to encourage tenant success.

All in all, the UBIs in Bali, Indonesia must consider economic, social, environmental, and cultural benefits when fostering technology transfer projects and nurturing start-ups or spin-offs. The results showed that economic benefits were the most crucial, followed by social, environmental, and cultural benefits. We surveyed university business incubators on developing sustainable and community-focused start-ups. Most respondents agreed that the incubator has the necessary skills to develop start-ups with societal benefits. Most respondents agreed that developing start-ups with broad societal benefits requires extra effort and professional support. They also found developing a profitable business model challenging.

3.2 Research Part 2: Sustainable Start-up Performance

3.2.1 Profile of Respondents

The profile of the respondents who completed the research questionnaire is presented as follows. The respondents in this study consist of start-ups that have either previously been incubated or are currently undergoing incubation at university-based business incubators in Bali Province. Out of the total 156 respondents, 30.1% (n = 47) of the start-ups were established in 2024, 21.2% (n = 33) in 2023, 7.7% (n = 10) in 2022, 7.1% (n = 11) in 2021, and 8.3% (n = 13) were founded in 2020. The remaining 24.4% (n = 38) of the start-ups were established prior to 2020. The distribution of the start-up respondents across industrial sectors is as follows: 32.4% (n = 54) of the start-ups operate in the fields of culture, creative industries, and the arts; 15.8% (n = 25) are engaged in information technology, software development, big data, artificial intelligence, telecommunications, and technology-based

education; 10.1% (n = 16) specialize in clean technology, environmentally friendly technologies, renewable energy, and environmental services; and 7.6% (n = 12) belong to the manufacturing sector. Additionally, 1.9% (n = 3) operate in the food and beverage sector and the education technology (edutech) sector, while 1.3% (n = 2) are involved in financial technology (fintech) and biotechnology or life sciences. The remaining 27.7% (n = 39) of the start-ups are distributed across various other industry sectors.

The following section presents additional information regarding the timeline of start-up incubation at UBIs. A total of 51 start-ups (32.7%) began their incubation process in 2024, 28 start-ups (17.9%) in 2023, 19 start-ups (12.2%) in 2022, and 12 start-ups (7.7%) in 2021 or earlier. Among the start-ups that have completed or are currently undergoing incubation, 61 (39.1%) have successfully graduated from the program, 72 (46.2%) are still in the incubation phase, 20 (12.8%) have withdrawn or dropped out, and 3 (1.9%) have not yet reached graduation. In terms of duration, most start-ups, 88 in total (56.4%), underwent incubation for less than one year. Meanwhile, 39 start-ups (25.0%) were incubated for one year, 20 start-ups (12.8%) for two years, 6 start-ups (3.8%) for three years, and 3 start-ups (1.9%) remained in incubation for more than three years.

3.2.2 Main Findings of Research Part 2

Based on the results of Research Part 2, all hypotheses proposed in this research are supported. The analytical results indicate that the sustainable entrepreneurial ecosystem (SEE) has a positive and statistically significant impact on the sustainable entrepreneurial process (SEP). Furthermore, the SEP demonstrates a positive and significant influence on production and commercialization. Additionally, the study confirms that the sustainable entrepreneurial process (SEP) mediates the relationship between the sustainable entrepreneurial ecosystem (SEE) and production and commercialization.

This thesis presents compelling evidence of the significant and positive influence of a sustainable entrepreneurial ecosystem on the sustainable entrepreneurial process, underscoring the necessity of structured support at every stage of development. The confirmed hypotheses provide valuable, actionable insights for a range of stakeholders, including universities, start-ups, government agencies, investors, and academic researchers. Nevertheless, recognizing the existing limitations offers important guidance for future research, enabling a more nuanced understanding and further refinement of sustainable

entrepreneurship ecosystems. By building on these findings, stakeholders are better positioned to collectively create and sustain a conducive environment for the growth of sustainable start-ups not only in Bali but also in other regions with similar developmental goals.

3.3 Conclusion of the Thesis

This doctoral dissertation, titled "Sustainable Start-Up Incubation: An Indonesian Case", contributes significantly to the academic discourse on entrepreneurial ecosystems, business incubation processes, and sustainable development in the context of higher education institutions. By integrating theoretical foundations with empirical findings, this research explores how university-based business incubators (UBIs) support student-led start-ups throughout their development lifecycle, particularly focusing on sustainability-oriented initiatives in Indonesia.

The first research part of the thesis provides a comprehensive overview of the characteristics and performance of UBIs in Indonesia. Utilizing a descriptive analysis approach, this section outlines the current state of university-based incubators, including their operational models, service offerings, funding sources, and alignment with national and global sustainability goals.

Key findings indicate that while most UBIs in Indonesia are still in their developmental stages, they demonstrate strong potential in supporting early-stage ventures, especially those with sustainability objectives. However, several challenges persist, such as limited access to capital, lack of professional mentorship, and insufficient integration with regional innovation systems.

A critical insight from this research is the importance of institutional support and strategic partnerships in enhancing the effectiveness of UBIs. The findings align with previous literature emphasizing the role of Technology Transfer Offices (TTOs), academic-industry collaboration, and policy frameworks in fostering a conducive environment for sustainable entrepreneurship.

The second research part of the thesis focused on sustainable entrepreneurial process by examining how students conceptualize, develop, and sustain environmentally and socially responsible business ideas. A novel conceptual framework was developed by integrating the

Sustainable Entrepreneurial Ecosystem (SEE) with the Sustainable Entrepreneurial Process (SEP). This conceptual model offers a multidimensional perspective on how university-based incubators facilitate sustainable start-up creation.

Quantitative data were collected through structured surveys targeting student entrepreneurs and incubator managers across selected universities in Bali, Indonesia. Using Partial Least Squares Structural Equation Modelling (PLS-SEM), the study tested various hypotheses related to the influence of incubation services, entrepreneurial motivation, and ecosystem dynamics on sustainable venture creation.

The results reveal that incubators play a pivotal role in shaping sustainable entrepreneurial intentions and outcomes. Key factors influencing successful sustainable start-up formation are included as: Access to tailored mentorship and coaching; Availability of green finance and sustainability-focused training programs; Strong alignment between personal values of student entrepreneurs and institutional missions promoting sustainability. Moreover, the study highlights the mediating effect of entrepreneurial self-efficacy and the moderating role of institutional support in transforming entrepreneurial intentions into actual sustainable ventures.

4. NEW AND NOVEL RESULTS OF THE THESIS

This thesis has several novelties. These contributions offer valuable insights for academics, policymakers, and incubator managers seeking to build resilient and socially responsible entrepreneurial ecosystems in Indonesia and beyond. The novelty of the thesis is summarized in Table 1.

Table 1: Summary of Research Novelty

(1) A Novel Conceptual framework of Sustainable Business Incubation	• The thesis introduces a novel conceptual framework that integrates the Sustainable Entrepreneurial Ecosystem (SEE) with the Sustainable Entrepreneurial Process (SEP). • Offering a multidimensional perspective and a PLS-SEM model on how university-based

	incubators support student led start-ups throughout their development lifecycle.
(2) Validation of the mediating role of SEP between SEE, production and commercialization.	• This research demonstrates the mediating role of SEP between SEE and the production and commercialization outcomes of start-ups providing one of the first quantitative confirmations of this relationship within an Indonesian setting.
(3) A bibliometric analysis and visualization of global literature on sustainable start-ups incubation.	• Using bibliometric tools such as VOSviewer to map research trends, keyword evolution, and theory development. This systematic approach not only identifies emerging themes and research gaps but also provides a foundation for future studies on sustainable business incubation.
(4) Implementation of Sustainable Impact Assessment (SIA) in a University Business Ecosystem	• This research proposes the use of Sustainable Impact Assessment (SIA) as a tool for evaluating start-up viability and long-term social and environmental impact. • This research also adopts an ecosystem perspective. Research Part I is focused on the profile of university business incubators that carry out the start-up incubation process. Research Part 2 analyzes the performance of start-ups resulting from the incubation process at the universities.

5. PRACTICAL APPLICABILITY OF THE RESULTS

This dissertation based on the analysis of UBIs in the case of Bali, Province, Indonesia, with a focus on sustainable entrepreneurship ecosystems and their impact on the entrepreneurial

process, has significant implications for various stakeholders involved in promoting start-up growth. This thesis carries theoretical and practical ramifications. The subsequent section delineates the implications for each stakeholder group.

Universities and Business Incubators

- Strengthening Support Systems

The findings confirm that a sustainable entrepreneurial ecosystem positively impacts all stages of the sustainable entrepreneurial process, including idea generation, prototyping, validation, production, and commercialization. Universities and business incubators can use this information to enhance their support systems by focusing on sustainability as a core component of their programs. For example:

- Incorporating sustainability modules can integrate sustainability training, workshops, and resources into existing incubator programs to help start-ups develop eco-friendly and socially responsible solutions.
- Sustainability focused mentorship can recruit mentors who specialize in sustainable practices to guide start-ups through the entrepreneurial journey.
- Green funding opportunities can develop or increase partnerhips with the funding sources that prioritize sustainable start-ups, such as green venture capital funds or government grants focused on sustainability.

- Enhancing Mediation Role

The mediation role of the sustainable entrepreneurial process (SEP) between the ecosystem and production/commercialization highlights the importance of structured support at each stage of incubation. Incubators should ensure that their programs provide continuous guidance and resources throughout the entire lifecycle of a start-ups, from ideation to market entry. This includes:

- Stage-specific and design tailored programs for each phase (e.g., idea generation workshops, prototype development labs, validation testing facilities).
- Feedback loops can establish mechanisms for regular feedback and adjustment to ensure start-ups are well-prepared for production and commercialization.

Start-ups and Entrepreneurs

- Adopting Sustainable Practices

Start-ups can leverage the positive influence of the sustainable entrepreneurial ecosystem by actively engaging with incubators and adopting sustainable practices in their operations. Focus on developing products or services that address environmental or social challenges aligns with the growing demand for sustainable offerings. The implementaion of resource-efficient processes during prototyping and validation to reduce costs and environmental impact and/or sustainability credentials in marketing and communication strategies can build trust with environmentally conscious consumers.

Government and Policymakers

The results emphasize the critical role of a supportive ecosystem in driving and promoting sustainable entrepreneurship policies. Governments can play a pivotal role by developing policies that incentivize sustainable start-ups, such as tax breaks, subsidies, or streamlined regulations for eco-friendly businesses. Nevertheless, funding initiatives can allocate budgets for sustainable innovation hubs or grants specifically targeting start-ups working on sustainability projects. Launching public campaigns can raise awareness about the benefits of sustainable entrepreneurship and encourage investment in this sector.

Policymakers can collaborate with universities to expand the reach of sustainable entrepreneurship programs. Joint initiatives and partnerhips can be involved with incubators to create regional or national networks of sustainable entrepreneurship centers. The usage of such research findings is implied to inform policy decisions and track the impact of sustainable entrepreneurship initiatives over time.

Investors and Funders

Investors can benefit from the study's findings by prioritizing start-ups that demonstrate a commitment to sustainability. For instamce, (1) focus on ventures that not only generate financial returns but also deliver positive environmental and social outcomes. (2) Incorporate sustainability metrics into due diligence processes to identify start-ups with long-term viability and scalability. (3) Investors can support UBIs by providing funding or resources to enhance their capacity to nurture sustainable start-ups with seed fundings to start-ups emerging from incubators. (4) Collaboration with incubators to co-create programs that bridge the gap between ideation and commercialization.

Academics and Researchers

Academics can build upon these findings by exploring additional aspects and further research opportunities: of sustainable entrepreneurship ecosystems. The cross-cultural comparisons can investigate how sustainable entrepreneurship ecosystems function in different cultural/sociatal contexts, particularly in other regions of Indonesia, Hungary or globally. Exploration of the role of technologies (e.g., AI, blockchain) can enhance the sustainability of entrepreneurial processes.

This study contributes to the theoretical framework of sustainable entrepreneurship by confirming the mediating role of the entrepreneurial process. Future researchers can refine these theories by expanding regressor variables such as regulatory environment, cultural factors, or technological readiness. The combination quantitative and qualitative methods and longitudinal approaches can gain deeper insights into the nuances of sustainable entrepreneurship.

6. LIMITATION AND FUTURE RESEARCH DIRECTION OF THE THESIS

6.1 Limitation of the Thesis

Despite the valuable contributions of this study, it is important to acknowledge its limitations to guide future research and practical applications:

1. Sample Limitations

- The study focuses solely on university business incubators in Bali, Indonesia. While this provides valuable insights into the local context, generalizing the findings to other regions may be challenging.

2. Methodological Considerations

- Data collected from tenant start-ups may be subject to self-report bias, as respondents might overstate the impact of the incubator or underreport challenges.
- The study uses cross-sectional data, which limits the ability to establish causal relationships. Longitudinal studies could provide stronger evidence of the impact of the ecosystem over time.

3. Measurement Tools

- Measurement of constructs like "sustainable entrepreneurial ecosystem" and "entrepreneurial process" relies on specific indicators. Using alternative measures or scales could yield different results. For instance, the study does not explicitly account for cultural factors that may influence perceptions of sustainability or entrepreneurship. Further research could explore how cultural values shape the effectiveness of sustainable entrepreneurship ecosystems.

4. Generalizability

- Findings may not be directly applicable to other provinces or countries with different economic, social, or regulatory environments. Future studies should replicate the research in diverse settings to enhance generalizability.

6.2 Recommendations for Future Research

To build upon the findings of this dissertation, the following areas are recommended for future investigation. Replicating this research in different cultural and economic contexts will help assess the universality or specificity of the proposed framework. Longitudinal analysis of incubated start-ups are recommended by tracking incubated ventures over time to evaluate survival rates, growth trajectories, and sustainability impacts. Integration of Artificial Intelligence (AI) and Big Data can optimize resource allocation and mentorship within incubation environments.

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PUBLICATIONS RELATED TO THE TOPIC OF THE THESIS

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Subject: PhD Publication List

Candidate: Ni Made Estiyanti
Doctoral School: Doctoral School of Management and Business
MTMT ID: 10085207

List of publications related to the dissertation

Articles, studies (16)

1. **Estiyanti, N. M.**, Novotny, Á., Máté, D., Vveinhardt, J.: Exploring Human Resource Management Challenges in Start-Up Ecosystems.
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