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Designing a dynamic investment model in an open innovation environment using the definitions of self-organization and organizational learning

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Abstract

In order to survive and succeed in today's ever-changing business world, both established organizations and startups must be able to adapt and innovate. A key factor in this is the concept of open innovation, which has revolutionized how organizations acquire knowledge by facilitating collaboration and interaction between different entities. For startups, who are new players in the market, it is crucial to remain constantly vigilant and adaptable in order to thrive. The lean startup methodology has gained popularity as a means to efficiently develop products and businesses. Investment plays a crucial role in the sustainability and growth of startups, and investors assess various factors when making investment decisions. However, previous studies have often analyzed these factors statically, without considering their dynamic interactions over time. This paper aims to explore the dynamics of startup ecosystems and the factors influencing investment decisions. It adopts a qualitative research approach, using expert opinions and existing literature to identify and analyze causal loops that impact the willingness to invest in startups. The study constructs a dynamic model that illustrates the relationships and feedback mechanisms among different variables, including learning, synergy, economic factors, financial risk, and startup value. The model reveals that multiple variables influence the willingness to invest, and their interactions create a complex dynamic system. Through scenario analyses, the paper suggests strategies to enhance investment readiness and attract investors. These scenarios include increasing cooperation to foster synergy, improving startup value through innovation and efficiency, and managing economic factors and financial risks. Sensitivity analysis demonstrates how changes in variables like cooperation can impact the willingness to invest. The research underscores the importance of understanding the interplay of these factors in a dynamic ecosystem to make informed investment decisions and foster startup success.

Keywords: Open Innovation, Investment, Self-Organization, Organizational Learning, Dynamic Model

Paper Type: Original Research

1. Introduction

For any organization or institution to stay relevant and survive in society's dynamic flow, it must identify itself and its immediate environment. Organization members gain such knowledge through a network of information processes. In the past, organizational learning was solely derived from internal information flows. As a result of the open innovation paradigm, the boundaries of information flows have been transformed. As part of the dynamic culture of open innovation, three parts of the network interact: organizations founded with new ideas, organizations that raise innovative ideas, and firms that lead their own entrepreneurship (Hyo Yun, 2020; Pourghader Chobar et al. 2021). As a result of its presence in a dynamic society, any institution faces a series of changes. Adjustments should be applied through channels of knowledge and reconfiguration to respond to a volatile environment agilely and carefully (Rahmani et al.., 2023). Startups are also a group of such institutions with intentions to enter the market with a new idea. Hence, they should be constantly alert, identify the changes in the environment, and stay prepared to align themselves with any upcoming shift. The concept of lean startup is currently introduced to reach the finest efficiency. Startups are always in need of financial sponsors to penetrate the market. Investment affects the sustainable performance and development of emerging firms (Asgari et al. 2022; Jeong, 2020). Depending on its position, every startup receives an investor's help during its lifecycle. To enter the startup investment

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sector, investors conduct assessments associated with the given startup's position in the lifecycle.Nowadays, startups want to be present in entrepreneurial settings. Entrepreneurial working environments require cooperation and interaction. A startup's transformation to address resource scarcity and align its conditions with the environment occasionally gives rise to innovation (Hanlon, 2007; Katila R., 2005). In previous research on startup interaction, limited factors were identified as primary reinforcing or mitigating factors. Previous studies, however, were conducted statically by eliminating the element of time. It always takes extensive research to examine the factors that contribute to value creation through learning (Ghezzi & Gavallo, 2020). A host of latent and observable factors affect stakeholder satisfaction and the relationship between the actors. Therefore, a model that can simultaneously consider multiple aspects is required to investigate the problem (Russo and Perrini, 2010). At a global studies level, the current subject's background shows that it focuses on isolated specialized domains, such as digital entrepreneurship, innovation, and open innovation. Several factors, such as open innovation implementation, its relationship with investment, and its influencing factors in entrepreneurship have not been studied. An analysis of startups operating in an entrepreneurial environment is conducted to determine the factors that influence their value creation, and subsequently, a model is proposed to clarify investment conditions. According to what has been discussed so far, the paper is structured as follows: Section 1 reviews previous research on the relevant topic; Section 3 presents the research methodology; Section 4 analyzes system dynamics and presents the results; Section 5 discusses and investigates; and Section 6 concludes.

2. Literature review

Following the definition of open innovation, organizations and firms showed an increased tendency to interact and establish alliances to gain more profits. At this point, business model innovation was introduced. The organizational size, alliance experience, and continuity are factors affecting the value obtained by business model innovation (Viktor and et al, 2016). An entrepreneurial setting is a type of open innovation environment where startups cooperate and sometimes form alliances. Despite their by and large common grounds with other types of businesses, startups, which can be regarded as an emergent phenomenon among newly-founded businesses, take a different course in their development process due to several unique characteristics. All firms or groups undoubtedly formulate a business model when they start working or process an idea. Startups can employ BMI to initiate their operation. BMI offers stakeholders a more precise perspective so they can enter the competition with a deeper evaluation. Organizations fail to achieve their goals if they cannot find an apt business model when starting a business. In recent years, extensive research has been conducted on BMI and lean startup (LS), and every study has attempted to investigate the governing relationship using a specific method. LS can be applied as a solution for the employment of knowledge flows in OI (Henry Chesbrough, 2020). The relevant research shows that using the innovation view in the business model has always been regarded as a competitive advantage (Zhang, et al., 2016). This competitive advantage is considered a value depending on the type of idea and the startup's position. Value creation is the most significant attribute for customers and firms (Chesbrough, et al, 2002). Innovation in business models results in distinguished products or services provided with lower costs. The firm ensures access to value through such an approach. Business model innovation always focuses on two primary dimensions: the first dimension is an organization's operations and resources, and the second dimension pays special attention to value capture (Daneshvar et al. 2023; Aufeh, 2004). Through their presence in an open innovation environment, therefore, startup teams nowadays exchange resources for value capture purposes. Despite their largely common grounds with other types of businesses, startups, which can be regarded as an emergent phenomenon among newly-founded businesses, take a different course in their development process due to several unique characteristics. Due to their position, startups require investors in their lifecycle. Launching an idea with minimum investment is one of the goals pursued by the lean startup (Table 1).

Table 1. Lean startup and innovation

Author(s)	Variables	Methods	Result
(Ghezzi & Cavallo, 2020)	Lean startup BMI Agile	Lean startup is related to agile methods and can be considered for BMI, which generates a framework that connects business model innovation and lean startup within the context of strategic agility.	
(Tohanean & Weiss, 2019)	Green business model innovation	Drawing on the existing business models and deducing specifics for the green business strategy	The lean startup provides a scientific approach to get a desired product to customers' hands faster.
(Bochen & Snihur, 2020)	Lean startup BMI	Using repetitive tests to mitigate business uncertainty and risk	The limitation caused by learning from customer response
		Engaging stakeholders and promoting collective learning	Suggesting that novel business models can emerge during experimentation

The idea of a lean startup is not exclusively about how to make a successful entrepreneurial business. Rather, it tells us how to take successful businesses as examples to enhance and develop our businesses. We can also use the lean startup to solve complex problems, and in general, the idea teaches us something: "how to learn faster from something that works well and avoid something that actually does not work for the business." The idea of lean startups is a way to develop businesses and products and focuses on shortening the product development process by employing a combination of hypothesis-driven business, review feedback loop, and validated learning. Business model canvas (BMC) gained a reputation after the lean startup's popularity. The canvas, which is indeed a template for strategic business management, was first introduced by Alexander Osterwalder and created to develop new business models and documentation of their status quo. Merging innovation and entrepreneurship allows a business to survive. The nature of an innovative activity is to propose a new idea to the market and respond to the market's requirements and changes (Zhao, 2005). Nowadays, the chief challenge that emerging firms face is to enhance their performance and take first place ahead of other competitors, which is achieved through entrepreneurial tendency and innovation (Oly Ndubisi & Agarwal, 2014). The self-organization theory suggests that following changes in the environment, systems transform to adapt to new circumstances (Shayan et al., 2018). On the other hand, the given definition has an indisputable relationship with lean startup-associated concepts. This adaptation occurs through the famous LS loop and repetition within it. In this loop, self-organization is performed through repetition-based learning. A crucial objective of LS is to remove redundancies, such as excess resources, sub-activities, incomplete work, and generally, anything that fails to bring added value. One of the significant tasks of the lean startup is to minimize the build-measure-learn loop, which is obtained through agility. The lean startup idea suits those startups that still seek a business model and value creation for products. The entrepreneurship club is an open innovation environment. The current startups in an entrepreneurial setting can benefit from the advantages of the dominating partnership spirit. The projects implemented in an open innovation environment have gained higher financial desirability (Leten, & Vanhaverbeke, 2014). Open innovation is the process of innovation distribution based on the management of the resulting organization and knowledge boundaries (Chesbrough & Bogers, 2015). They primarily focus on values and detect and remove anything that adds no value to the product. The elimination of redundant items refers to the exclusion of excess documentation, tasks, and meetings and saving time and resources. The traditional approach is as follows: writing a thorough plan, absorbing investors, building a team, introducing a product, and initiating the sales on a full scale. Many startups begin their work with ideas that are assumed to be what people want. After months or years, a product that manufacturers deem complete is provided. When they fail, they realize they should have shown the product to customers and involved customer preference in fabricating the product. This is the prime cause of failures among startups. Lean startups practice agile development (which is essentially associated with the software industry but is currently employed in other sectors, as well). The main idea behind the lean startup methodology is for the firms to spend less time repeating the manufacturing stages, receive customer needs more quickly, mitigate the market risk, resolve the need for the initial large capital, and launch the products to the market with lower prices. An entrepreneurial ecosystem is a targeting society of economic actors that work together toward higher value and strength (Sohrabi et al. 2021; Brown & Mason, 2017). These ecosystems provide the means of participatory processes for startups for value-creation purposes (Adner, 2006). Examples of such ecosystems include startup accelerators and entrepreneurial companies. By providing a cooperation setting, they allow startup teams to make the most of their presence in such environments. Entrepreneurial centers are a group of coordinated actors who have prepared a context in which organizations, institutions, and startups are flexibly communicating with each other (Brown & Mason, 2017). A proposed definition for open innovation is efficiency maximization in research and development (R&D) investments through win-win partnerships between enterprises that are currently operating in the industry. Through direct (stock purchasing) or indirect (investment fund) investment in startups, firms make venture capital decisions with financial or strategic goals. Modern economists have attained valuable approaches to direct and indirect knowledge investment, including franchise fee payment, R&D costs, required capital for personnel training, rate of new market-presentable products, and so on.

3. Research Methodology

The research methodology is an applied survey in terms of objective and data collection methods, respectively. The present research employed specialized books, relevant papers, and journals to cover the theoretical subjects. Using Sandelowski and Barroso's seven-step method (Sandelowski & Barroso, 2006) and targeted sampling from available scientific resources, 126 initial samples were collected in separate fields, such as entrepreneurship, innovation, open innovation, innovation business model, and lean startup. After the irrelevant contents were removed using the process of meta-synthesis study, 33 papers were eventually selected as the final samples, the influencing

factors based on the researcher's opinion were extracted, and a framework was developed through the thematic analysis method. Furthermore, 13 experts were surveyed for data collection and opinion consensus.
System dynamics is a method to grasp an understanding of dynamic and sustainable behavior in complex systems (Sosnowska, Kuppens, De Fruyt, & Hofmans, 2019). Following qualitative and economic developments, financial and investment decisions are nowadays regarded as significant decisions during which the highest quality and the greatest yield should be achieved (Aoun & Hwang, 2008). The methodology employed in this research presents both strengths and limitations in its approach to understanding the complex dynamics of startup ecosystems and investment decisions. The construction of a dynamic model offers a comprehensive framework to capture the intricate relationships between variables. However, it is important to evaluate the advantages and drawbacks of this methodology in more detail.

Methodology Pros and Cons:

Pros: Holistic Understanding: The dynamic model provides a holistic view of how various factors interact within the startup ecosystem. By visualizing the causal relationships and feedback loops, the model aids in identifying complex interdependencies that might be overlooked in traditional static analyses (Sagi, Shlezinger, & Routtenberg, 2023). Realistic Representation: The model's dynamic nature mirrors the real-world behavior of startup ecosystems, where variables are interconnected and change over time. This approach enables a more accurate representation of the dynamic nature of investments and startups. Scenario Analysis: The model's flexibility allows for scenario analyses, helping stakeholders explore the potential outcomes of different strategies. These scenarios provide actionable insights that can guide investment decisions and strategic planning (Pujiharto et al., 2023).
Cons: Simplification: Like all models, the dynamic model necessarily simplifies the real-world complexity to make it manageable. This simplification might omit certain nuanced relationships or variables that could have an impact on investment decisions. Data Requirements: Constructing and calibrating a dynamic model requires relevant data inputs. The accuracy and validity of the model heavily depend on the quality of data available. Inaccurate or insufficient data could compromise the reliability of model predictions. Complexity: While the dynamic model offers a comprehensive view, it can also be complex and challenging to communicate effectively to non-experts. Ensuring the model's transparency and ease of interpretation becomes essential to its usefulness (Krause, 2023). Incorporating a dynamic model into the methodology enriches the analysis of startup ecosystems and investment decisions. The model's strengths lie in its ability to capture intricate dynamics and provide insights through scenario analyses. However, it's crucial to acknowledge the potential limitations of simplification, data requirements, and complexity. As the methodology evolves, it's imperative to balance its benefits with its challenges and continue refining it to enhance its applicability and relevance to real-world situations.

3.1 Research Implementation Method

Figure.1 shows the process through which the present research is conducted. The problem statement was provided by previous research reviews, and latent and observable variables were determined by studying the subject literature and conducting a survey from experts. In the next step, impractical variables were removed by the expert interview and survey. The given variables were applied as the model's primary inputs; further, the cause-and-effect diagram was devised, the dynamic model was completed, and ultimately, various scenarios were presented, and the optimal policy was specified.

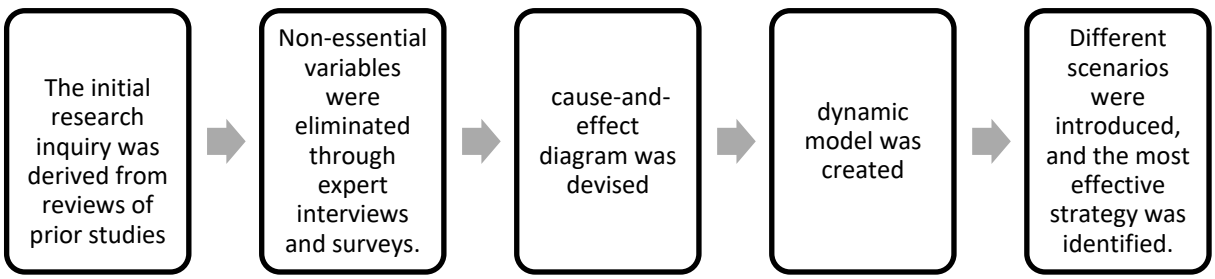

Figure 1. Research Road Map

Case study: The research's case study includes startups operating in three entrepreneurial clubs and groups. By providing the right setting, the given entrepreneurial clubs absorb startup teams, offering a suitable context for cooperation. More than 20 startup teams are working in these groups, and 17 of them are used as the research information sources.

3.2 Data Analysis

Step 1: Problem Statement

This stage is regarded as one of the most crucial parts of modeling. It helps achieve the desired results when the problem, hypotheses, objectives, and expected results are defined accurately (Turner, Menendez, Gates, Tedeschi, & Atzori, 2016). In recent years, new ideas have found greater significance and popularity as a result of the growth in startups and entrepreneurial groups. Before this period, startups used to operate separately. However, the tendency toward attending such clubs increased upon the setting preparations. Teams have managed to benefit greatly through their presence in such clubs, but a constant challenge for startups has always been finding investors and persuading them to make investments. According to global statistics, nearly 100 million startups have entered the competition (www.get2growth.com, 2014). Therefore, it has added to the intensity of the competition to gain investor sentiment. Startup teams face challenges in attracting investors, and investors make investments in search of maximum desirability. When a business is launched based on a new idea, it is accompanied by unpredictable complications and difficulties; in the beginning, however, it is relatively effective to have adequate knowledge of the market and financing methods. To this end, the present research reviews the available literature and documents regarding the status of the investment process, and accordingly, the influencing variables are identified, the effect of the given factors is studied in a dynamic model, and a solution is proposed to improve the situation.

Step 2: Identification of the research variables

The required research variables are obtained through a review of previous research, available documents, and a survey from 13 experts, who included 5 managers and assistant directors of entrepreneurial clubs, 3 appraisers introduced by investors for startup valuation, 3 financial managers of accelerators, and 2 supervisors of profitable startup teams. A total number of 10 variables were identified after conducting the investigation and research. In the next step, the interview method and the calculation of the highest average score are employed to determine the most significant latent and observable variables that affect investment. Table 2 shows the research variables.

Table 2. research variables

No.	Author(s) and year	Identified variable	Method and Result
1	(De Toni & De Marchi, 2023)	Self-Organization in Open Innovation environment	Self-Organised Schools: Educational Leadership and Innovative Learning Environments" presents research from fourteen Italian schools, revealing a positive link between self-organization and innovative learning environments, emphasizing self-organization as a crucial aspect of effective leadership.
2	(Thonet, 2023)	Self-Organization	What do the competency areas of self-organized teams encompass, and what are the key challenges that require addressing. What role frameworks are essential for these teams, and how can the existing level of agility be gauged. This chapter provides comprehensive answers, along with guidelines and checklists to assist you
3	(Tonellato, et al., 2023)	innovative organizational solutions	This research examines innovative organizational solutions to resource allocation and coordination challenges. It proposes a self-organizing attention network framework comprising microstructural mechanisms, validated through open-source software analysis, with broad applicability to decentralized problem-solving contexts
4	Zhang, et al., 2023)	Learning	Open innovation's impact on sustainable competitive advantage is mediated by ambidextrous learning and moderated by knowledge management capability.
5	Annamalah, et al., 2023)	human resource, structural relational as a potential to build innovation	Traditional regional development emphasizes resource exploitation and innovation potential, often neglecting social aspects. This study proposes involving the business community and regional open innovation for balanced growth. While tourism development can enhance innovation, external collaboration is vital for its regional and economic impact. The study explores human, structural, and relational capital within local tourism, highlighting the interplay between social capital and innovation for sustainable growth. Building and sustaining social capital bridges are crucial for non-traditional innovation and regional progress.
6	(Lin & Lee, 2005)	Organizational learning - knowledge management in Open Innovation environment	The analysis demonstrated a strong connection between organizational learning factors, knowledge management processes, and the extent of e-business systems adoption. However, knowledge sharing had no significant impact on the level of adoption

7	(Zhu, Dong, Xu, & Kraemer, 2006)	Competitive advantage – compatibility – costs – security concern – technology competence – organizational size – readiness to adopt the environment	Using an integrative model, this study examines factors influencing post-adoption stages of innovation diffusion in enterprise digital transformation. Compatibility, technology competence, partner readiness, and competitive pressure impact adoption and performance. The research highlights the importance of considering both innovation characteristics and contextual factors in understanding innovation diffusion. Additionally, cross-country analysis underscores economic and regulatory influences on diffusion among developed European countries
8	(Schaffers et al., 2011)	IT infrastructure – education – business networking – innovation demand – open and cooperative business model	Smart cities address complex urban challenges via open, user-driven innovation. They leverage Future Internet-enabled services for sustainable development
9	(Appleyard & Chesbrough, 2017)	The Dynamics of Open Strategy	The shift toward open innovation lacks clear understanding of initial motivations and sustainability. Open and proprietary strategies depend on growth goals and competencies, altering over market phases.
10	(Ferro & Bonacelli, 2010)	Coopration in Open innovation environment	Open Innovation is a novel approach to collaboration, seeking competitive edge through external innovation and internal tech application. Implementing it demands specific community management skills. This study explores this aspect through a Natura case study, showing diverse communities influence knowledge access, contracts, and more, requiring innovative managerial approaches.
11	(Harms, 2015)	SRL has a positive relationship with personal-level evaluation. Team learning and psychological safety are positively associated with group-level evaluation.	contemporary entrepreneurship education often involves team challenges. Individual self-regulated learning and team learning affect assessments positively, informing effective learning strategies.
12	(Seo & Park, 2022)	When is interorganizational learning beneficial for inbound open innovation of ventures. A contingent role of entrepreneurial orientation	Inbound open innovation helps ventures bridge knowledge gaps, but smallness and newness might limit innovation benefits. Interorganizational learning and entrepreneurial orientation enhance innovation performance, fostering value creation and capture. This study highlights the importance of leveraging both exploitative and exploratory learning within external networks for innovation success.
13	(Osterwalder & Yves, 2010)	Communications and relations in a network	Key value, infrastructures, and resources, including activities, assets, and business partners, customers, including communication channels and relations with customers and target market, financial issues including costs, income flow
14	(Maennel and Ottis, and Maennel 2017)	The LS loop consists of learning, measurement, and idea.	Innovation networks drive development, but understanding their effects is lacking. Factors like cooperation and learning influence innovation output
15	(Rangan, Samii, & Van, 2006)	Participation improves technology transfer through the devised relationships, influences self-organization, and enhances efficacy.	Innovation networks foster development; gaps exist in understanding effects. Factors like cooperation, embedding, and learning influence innovation output
16	(Shayan, Elahi, Ghazinoory, & Khodadad Hoseini, 2018)		Innovation drives national wealth and development, with tailored strategies and policies. Innovation networks, promoting high-tech development through collaboration and learning, are gaining attention. This research addresses gaps in understanding their effects and prerequisites. Case studies and surveys explore factors like cooperation, network embedding, and environment, revealing their influence on learning, self-organization, and cooperation. These network capabilities further enhance innovation output and network effectiveness.
17	(Engelsberger, et al.,2022)	open innovation helps ventures bridge knowledge gaps	Strategic HRM supports employee innovation in high-tech firms. This study introduces the concept of "OI mindset" mediating SHRM's impact on open innovation performance.
18	(Rahmani, et al.,2023)	effect of Learning and self-organization on open innovation	Open innovation adoption enhances societal and economic performance. This study investigates self-organization and learning's impact on open innovation environments, particularly for startups. Using field data, structural equation modelling, and game theory, it concludes that investing in startups within open innovation environments yields higher value and collaboration benefits

Formulation of Dynamic Hypotheses

According to the diagram of the annual trend of the investor sentiment index in 2019 and 2020, the sentiment number has been fixed or gone through fluctuating shifts. Such behaviors may be rooted in the fact that the number of startups has increased over the past two years, which makes investors consider startup investment with more

scrutiny and higher uncertainty. On the other hand, given the soaring number of startups and their tendency to access accelerators and entrepreneurial clubs, these open innovation environments have been facing increased demands, but the number of entrepreneurial centers is not accordingly raised at the same pace as that of startups.

Step 3: Simulation and Representation of the System Dynamics Model

In this section, we seek to investigate a synthetic model of latent and observable variables and their cross-impacts in the form of a cause-and-effect model by introducing the major identified indices and screened variables. Furthermore, we identify the cross-impacts and apply a scenario that leads to a sustainable improvement process. Based on expert opinions and subject literature, the present research considers a month time horizon to give adequate time for the feedback to work.

Causal Loop Diagram and State-Flow Diagram

After the variables were identified, given the qualitative nature of the research problem, the cause/effect loops were generated according to the expert opinions. The model contains 2 balancing loops and 4 reinforcing loops, which are discussed in detail.

- Loop Number 1, consisting of 2 steps, the graph explores the relationship between willingness to invest, synergy, and the need for financial resources.
- Loop Number 2, also comprising 2 steps, focuses on the willingness to invest and its connection to economic environmental factors and financial risk.
- The third loop, which consists of 3 steps, delves into the willingness to invest and its association with embedding, self-organization, and startup value.
- Finally, Loop Number 4, also encompassing 3 steps, investigates the relationship between willingness to invest, synergy, learning, and startup value.

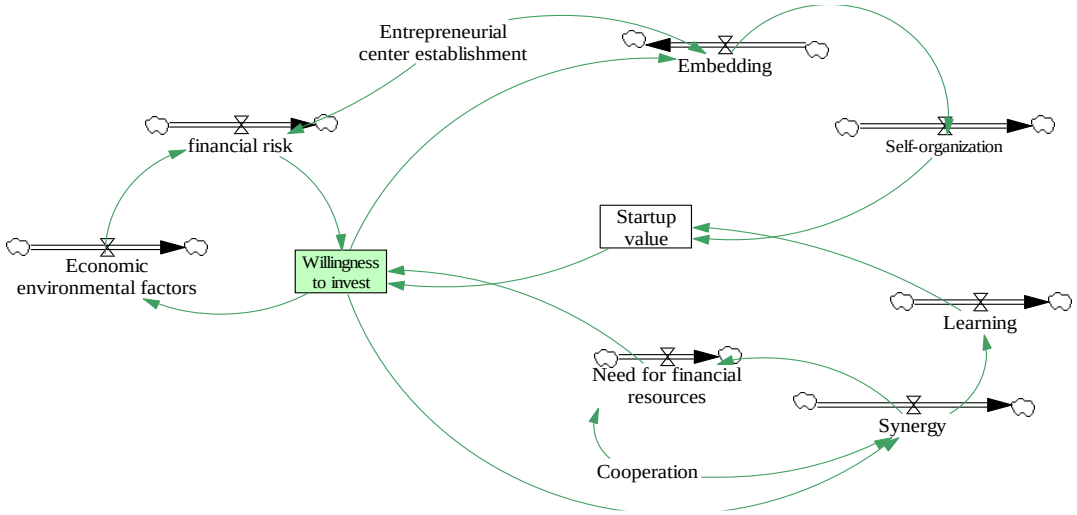

Figure 2. Causal Loop Diagram

The Figure 2 illustrates the variables that directly or indirectly impact the variable of willingness to invest. For instance, the variable "startup value" has an influence on the variable "willingness to invest." However, it is worth noting that this variable is influenced by the variables of learning and self-organization. As observed, the variable of willingness to invest significantly influences three variables: economic environmental factors, embedding, and synergy. We can examine the behavior of these variables with respect to certain changes in the model's parameters using the diagrams. Considering the qualitative nature of the variables, the formulas merely focus on exploring the relationships between them. Using the Figure 3, we can delve into the analysis of how these variables respond

to variations in the model parameters. Given the qualitative nature of the variables, the formulas primarily investigate the interrelationships among them.

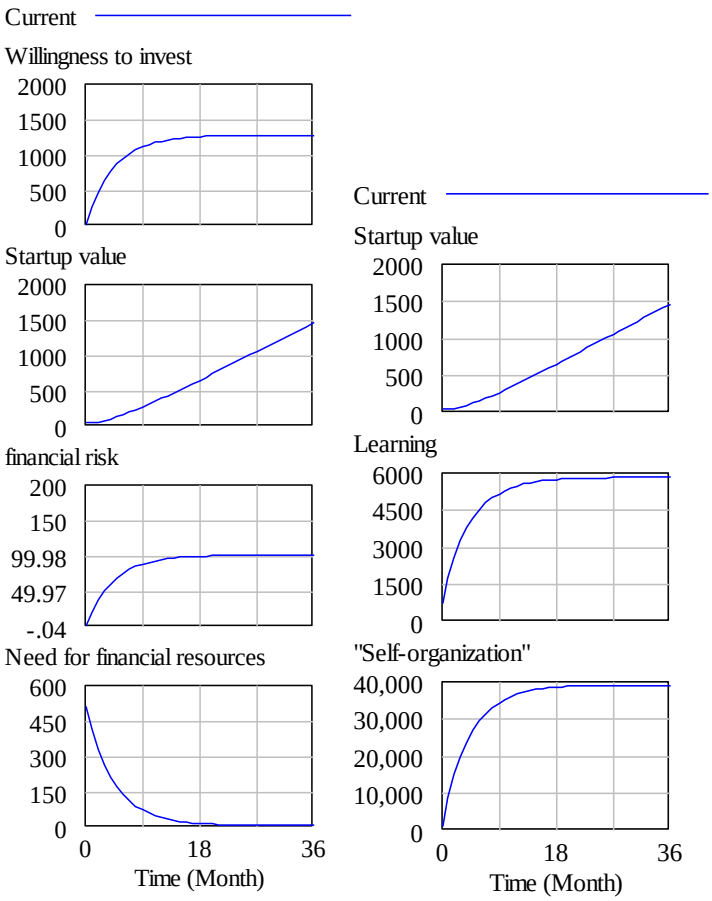

Figure 3. Dynamic Behavior Chart

Suggested Scenarios

Scenario1: The Figure 4 and 5 also simultaneously illustrates the relationship between multiple variables with the variable of willingness to collaborate. Therefore, in Scenario 1, it can be assumed that an increase in the variable "learning" has a positive effect on increasing the willingness to invest. Thus, the value of learning should be enhanced. Increasing learning leads to an increase in the startup value, subsequently boosting the willingness to invest. The increase in learning is dependent on the variables of synergy, cooperation, and the need for financial resources. The higher the level of cooperation, the better the learning outcomes.

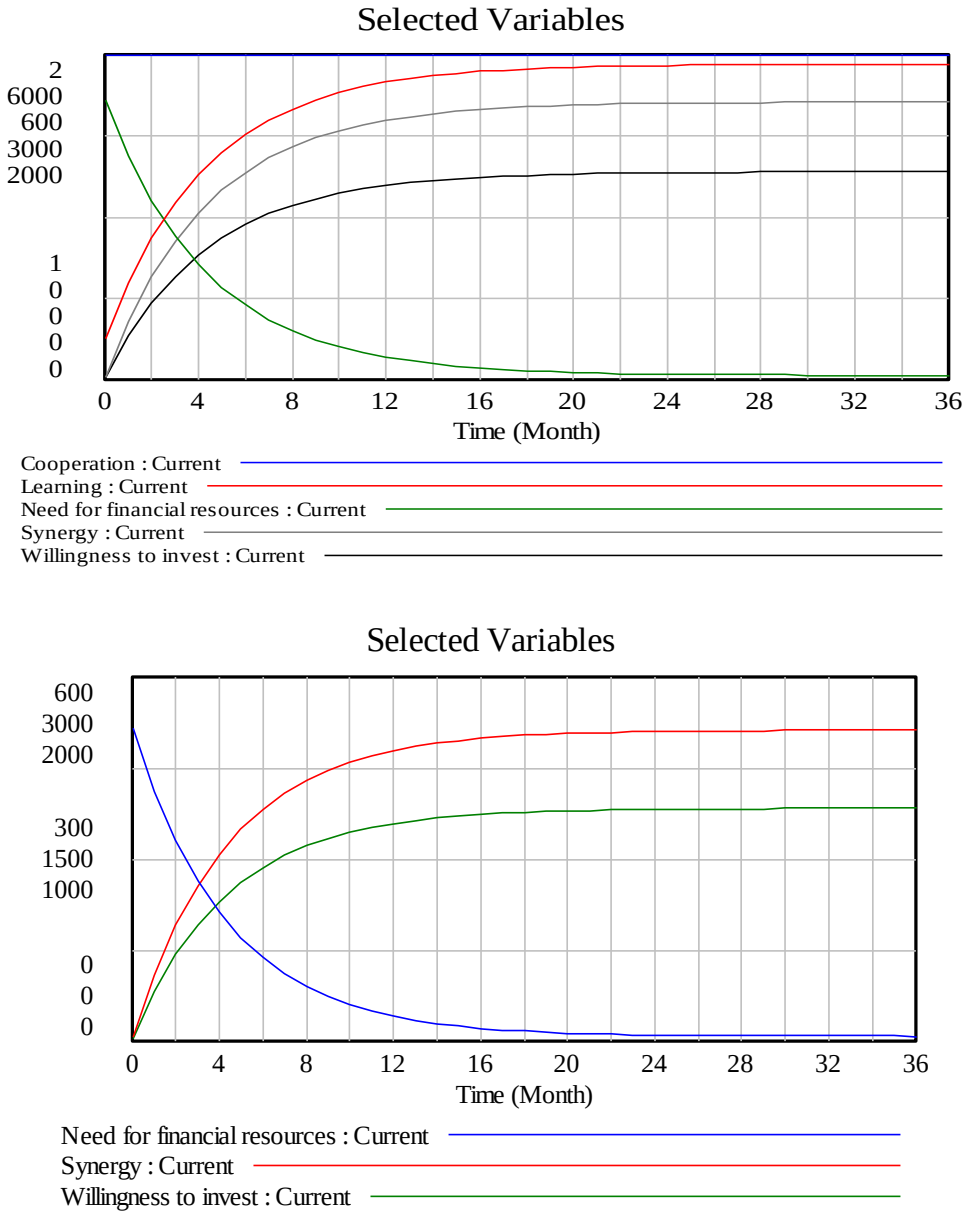

Figure 4 & 5. Exploring the Interplay of Variable

As observed, an increase in the values of the variables "learning" and "synergy," coupled with a decrease in the variable "need for financial resources," results in an increase in the variable of willingness to invest. Furthermore, the diagram below illustrates that with an increase in synergy, the need for financial resources decreases, leading to an increased willingness to invest. These findings suggest that by focusing on enhancing learning, fostering synergy, and effectively managing financial resources, we can positively impact the willingness to invest.

Scenario 2: Increasing Cooperation for Enhanced Synergy

In this scenario, increasing the constant value of cooperation leads to a corresponding increase in synergy. By elevating cooperation, we aim to foster collaboration among stakeholders such as startups, investors, experts, and research institutions. Creating platforms for networking and joint projects promotes synergy within the system. Greater cooperation results in improved synergy, combining diverse perspectives and resources. This leads to enhanced innovation, efficiency, and effectiveness in the dynamic system. Measuring indicators like successful partnerships and overall startup performance helps assess the impact of this scenario. Implementing this scenario emphasizes the importance of cooperation, contributing to a thriving and collaborative startup ecosystem.

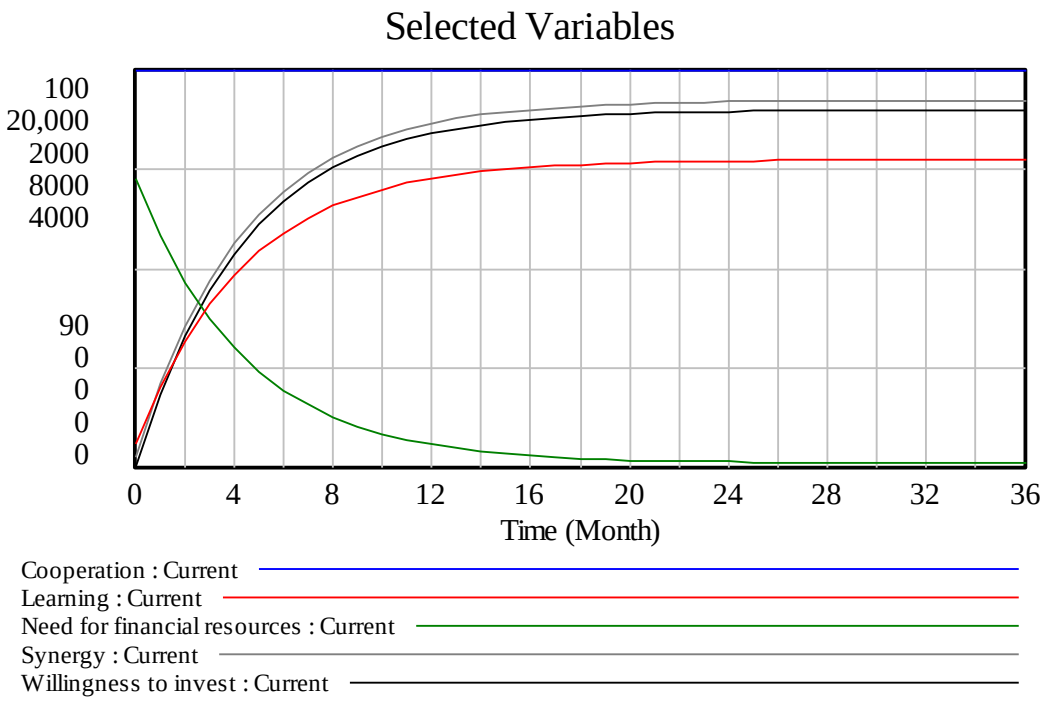

Figure 6: Increasing Cooperation for Enhanced Synergy

Scenario 3: Increasing Startup Value

To increase the willingness to invest, it is crucial to enhance the startup value by improving related variables. To implement this scenario, focus on measures to strengthen the startup's value. This involves improving product/service development, market positioning, branding, customer acquisition, and operational efficiency. By addressing factors that contribute to startup value, such as leveraging competitive advantages, fostering innovation, optimizing resource allocation, and implementing effective management practices, we can attract investors. Enhancing the startup value creates a favorable investment environment, indicating greater potential for returns and success. Implementing this scenario emphasizes continuously improving the startup's value proposition, encouraging investment and growth.

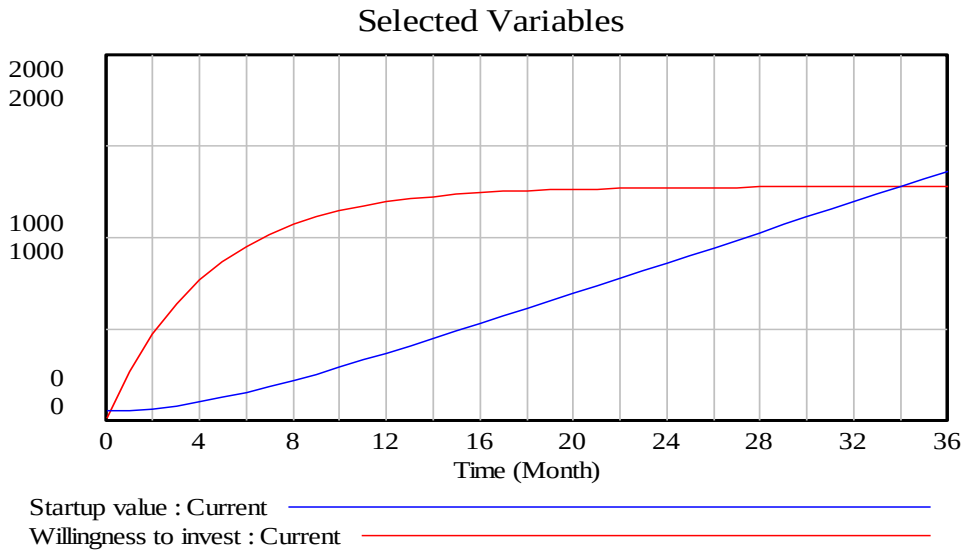

Figure 7. Increasing Startup Value

Scenario 4: Economic Factors and Financial Risk

Economic factors positively influence willingness to invest. However, as financial risk increases, investment momentum decreases. Effective risk management strategies are crucial to mitigate the impact of financial risk on investment decisions.

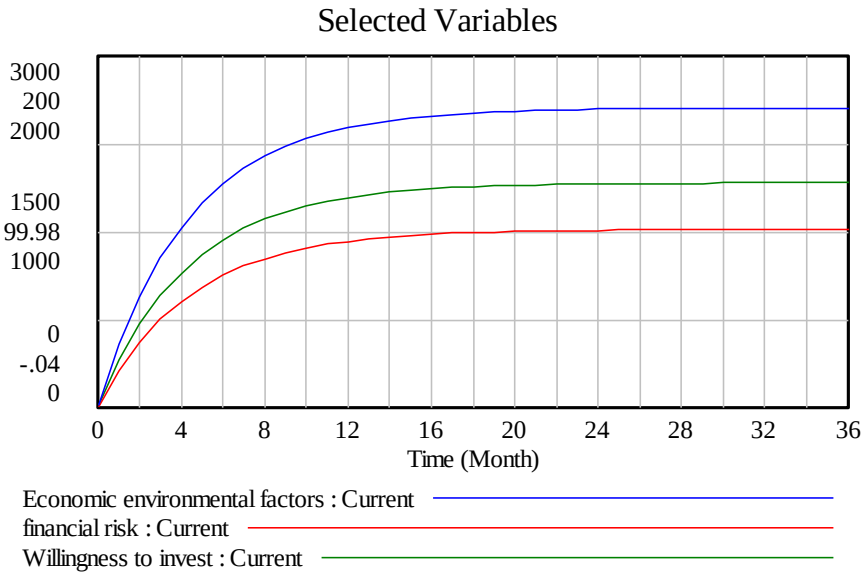

Figure 8. Economic Factors and Financial Risk

4.2. Sensitivity Analysis

We can examine the changes in the model by varying its parameters. As an example, we conduct a sensitivity analysis of the willingness to invest based on changes in the cooperation variable. We investigate the variable's impact by considering its minimum and maximum values. The graph displays the willingness to invest for the minimum value of cooperation as a red line and for the maximum value of cooperation as a blue line. This allows us to observe the sensitivity of the willingness to invest to changes in the cooperation variable.

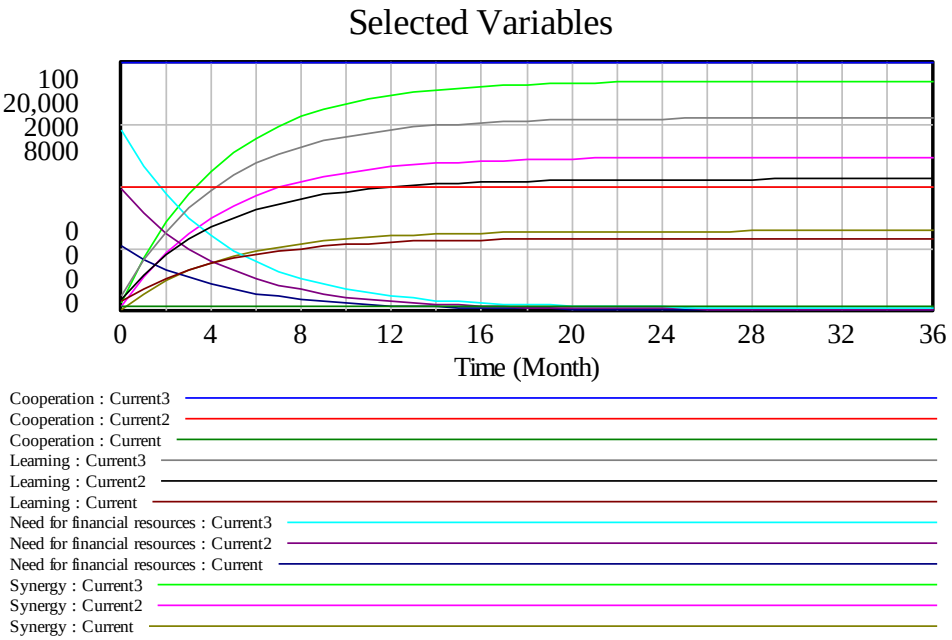

Figure 9. Sensitivity Analysis

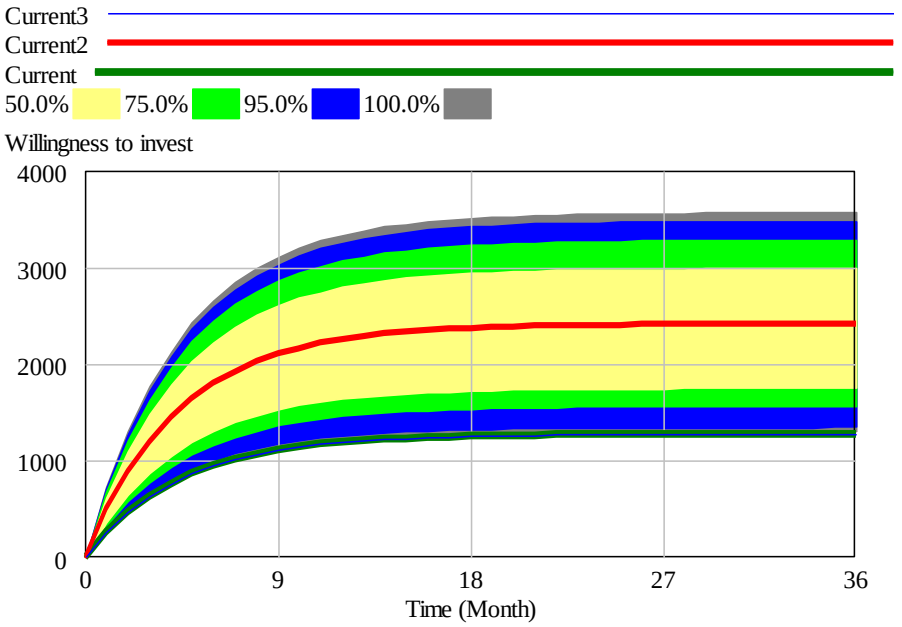

Figure 10. Sensitivity Analysis

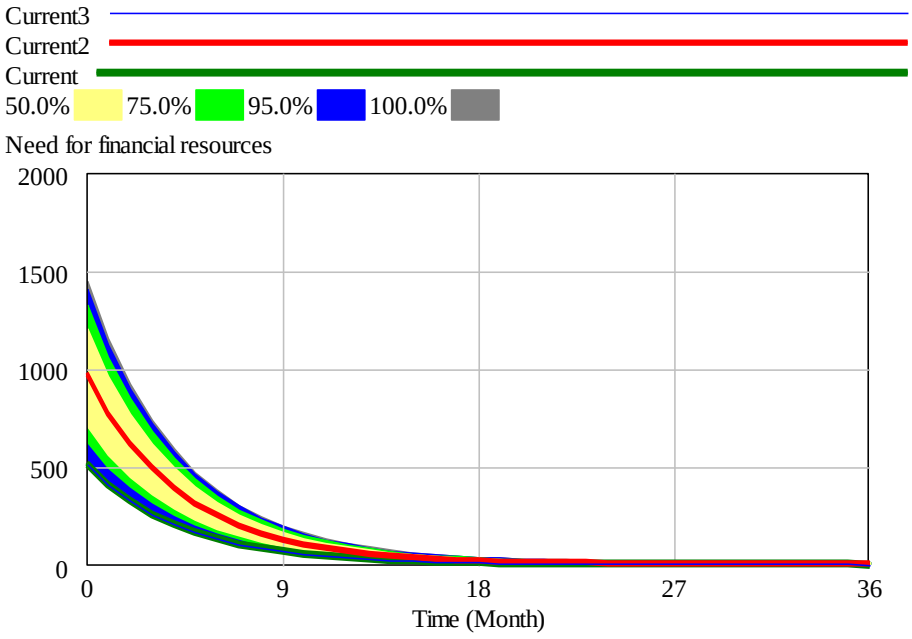

Figure 11. Sensitivity Analysis

5. Conclusion

In conclusion, this study has meticulously explored the intricate nuances of startup ecosystems, shedding light on the complex tapestry of variables that shape investment decisions. Our qualitative approach, drawing on expert insights and a comprehensive literature review, has yielded a dynamic model that unveils the intricate relationships and feedback loops governing these interactions. Our mission was to decipher the behavior of investment willingness within this dynamic system, identifying crucial determinants like learning, synergy, economic factors, financial risk, and startup value. To bridge theory with practical application, our study's conclusion underscores the actionable insights gleaned from our analysis. Through a series of scenarios focused on enhancing investment readiness, fostering synergy, elevating startup value, and managing financial risks, we offer practical strategies for startups and investors to navigate the intricate landscape. These strategies empower stakeholders to make informed choices, navigating the complexities of startup investment. Looking ahead, addressing the noted limitations and refining our model through further research and real-world validation is pivotal. An enriched and more detailed conclusion, replete with specific responses to our research inquiries, will heighten the study's worth and contribute to a deeper comprehension of the forces steering startup investment decisions. Ultimately, our research serves as a pivotal stepping stone toward cultivating a vibrant and sustainable startup ecosystem. As educators, we encourage students to build on this foundation, fostering a future where innovation and entrepreneurship flourish.

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