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Viable System Model as A Framework for Value Co-Creation Service System Analysis of Technology-based Business Incubator

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Abstract
Bandung Techno Park (BTP) at Telkom University has a crucial role in the technology-based business incubation scheme. From the recruitment process, learning goals, venture capital, commercialization with all impacted to start-ups accomplishment. These observations resulted by using qualitative research methods for one year. Referring to the concept of service systems, it was founded that business incubators in higher education can produce the holistic service system diagnostics to develop the external collaboration between university and industry. These findings are successfully set out by used the Viable System Model (VSM) from service system science approach which is divided into five main functions: (1) Operationalization, (2) Coordination, (3) Monitoring and Control, (4) Intelligence, (5) Policy. The important collaboration of the integrated service system at BTP is framed in a structured concept. Incubator operation supervision focuses on service systems that play a role in four types of management, namely: business innovation and incubation, tenant service and support, marketing, and technology solutions. The findings of the analysis with VSM relate to the role of technology-based business incubators in creating value co-creation from a service science point of view.

Keywords— Value Co-creation; New Technology-based Firms; Business Incubators; University-industry Collaboration

I. INTRODUCTION

The business model of technology-based incubators is currently started through a rigid classification as university incubators, virtual incubators, (Tang, M., Walsh, GS, Li, C., & Baskaran, A; 2021), regional business incubators, company-internal incubator (Zedtwitz, M. V; 2003). They appear to be classified in this way based on the economic and business implications of each according to their classification. Economic growth is the result of contributions from discussions on production, development of science and technology and innovation from the University (Bercovitz, J., & Feldman, M; 2006). Universities that are assigned a role as a source of technological advancement must demonstrate intensive collaboration with industry has built good relationships and forming an environment conducive to advancing the potential of technology-based entrepreneurship is a new responsibility (Bolzani, D., Rasmussen, E., & Fini, R. (2020). By presenting a business incubator at the university, it is hoped that the results of research, findings, innovation, from faculty members can be developed to find a way to a bigger industry and market (Etzkowitz, H., & Zhou, C; 2017). Able to create jobs and have an impact on economic growth. A good scenario by if the institution build collaboration in a conducive integration arrangement with many stakes holder systematically as developing value co-creation interaction as an active, creative, and social process based on collaboration between the provider and customer (Mangkusubroto, K., Putro, U. S., Novani, S., & Kijima, K.; 2016)

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In 2005, Janet Bercovitz of the University of Illinois at Urbana-Champaign, USA, teamed up with Maryann Feldmann of the Joseph L. Rotman School of Management at the University of Toronto, Canada, to publish a study in The Journal of Technology Transfer, one of the from a journal that focuses on providing an international forum for research on the economic, managerial, and technological aspects of technology transfer. The research conducted focuses on the relationship between the external environment and organizations (government, public institutions, companies, institutions). Their writings propose ideas for two-way collaboration between academia and industry. Seeing the mutualism of the two. Observations were made from student recruitment to formal exchanges related to institutions and government regulations and policies. These factors allow university-industry connections to reach the Startup level whose development also involves the government. This relationship is depicted as can be seen in Figure 1:

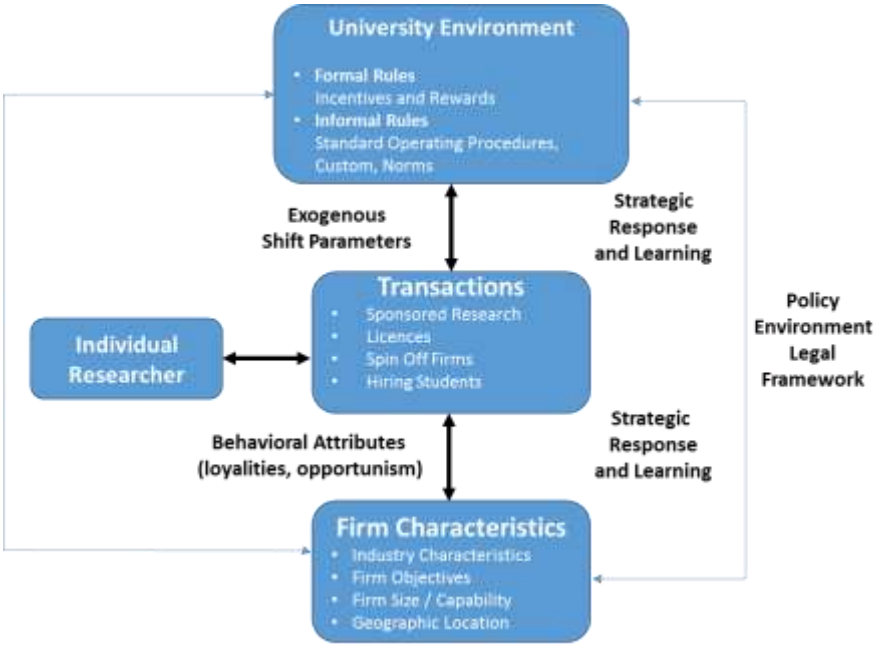

Figure 1. University – Industry Relationship Scheme (Bercovitz, J., & Feldman, M., 2006)

Using Stafford Beer's Viable System Model (VSM), this study aims to see a two-way relationship between universities and industry from the other side. However, it is vital to pay attention to the form of university-industry contacts that occur at the beginning of this research, which adheres to the design provided by Bercovitz and Feldman in 2006, as shown in Figure 1. This scheme attempts to explain the reciprocal interaction between universities as centers of higher education and industry to conduct research. Previously, they considered the research entity as an independent actor that conducted research to address market demands by bringing a well-known name to the institution. The reciprocal relationship between the two is governed by formal rules that provide researchers with incentives and rewards. In contrast, informal rules govern standard operating procedures and other critical regulations. In terms of the quantity of funding offered as research sponsors, the industry is viewed as an entity participating in research transactions. Licenses are secured by access to data, measurement, observation, and other research interests. However, the transaction also involves efforts to convert research findings into new company ventures known as startups involving university students. The qualities of new business startups produced through this plan are as follows: they have defined aims, continue to grow capabilities, and cover the country geographically by providing possibilities to build new business startups from students located in remote places. It can acquire behavioral characteristics such as loyalty and opportunism from all participants in the industrial connection system, which we refer to as dynamic actors.

Bandung Techno Park (BTP) is an incubator for Indonesian technology-based businesses founded by the Indonesian Ministries of Research and Technology, Industry, and Education and Culture. Telkom University's

Division of Research and Innovation, UPT Telematics and Telecommunication Design Centre, and the West Java Department of Industry and Trade collaborate to improve the environment. Because BTP is a company founded in a technological incubator. It serves three critical functions:

- research and development
- establishment and growth of technology-based enterprises (spin-offs)
- establishment and development of industrial clusters or companies located outside regions.

This study aims to observe and investigate how the standard form of three significant responsibilities at Bandung Techno Park makes use of the Viable System Model (VSM). As a starting point, Bandung Techno Park can conduct an analysis involving many participants in order to comprehend the previously integrated service system. This research may eventually result in developing a system model that can be used as a conceptual framework for comprehending the role of technology-based business incubators in creating shared value.

II. LITERATURE REVIEW

Service System

Service system in its concept defines a complete configuration of people, technology, organization, shared information, that can be able to create value providers and customers or external entities through service (P. P. Maglio and J. Spohrer, et.al, 2019). This study tries to describe from the perspective of the universe of discourse to look holistically to give the modeling constructs a real-world interpretation. The results of the interpretation which will be described in a model of the results of the observers' point of view will be analyzed from the service side of Bandung Techno Park as a technology-based business incubator.

The main reason for choosing service science to discuss more deeply in this research is because service science is currently a transdisciplinary science that is growing among learning researchers for the phenomenon of value co-creation (Storbacka, K., Brodie, R. J., Böhmann, T., Maglio, P. P. & Nenonen, S., , 2016). Process value co-creation which will also provide support to a lot of research in the 21st century for service innovations from various disciplines, across sectors that will later have the involvement of one another (Prahalad, C. K., & Ramaswamy, V; 2004). Collaborative relationships in the form of individuals, groups and institutions can be used as a reference for future research. The main concept of service science that provides facilities for the creation of transactional relationships between many disciplines which is the main basis for being able to analyze each system (Barile, S., & Polese, F.; 2010) involved in this study, both individuals and groups to explain the two-way relationship of each system in Bandung Techno Park.

Service Science

Service science (SS) has a main foundation known as ten principles which consist of governance interactions from various resources, entities, access rights, value of shared creative interactions, actor interactions, outcomes, stakeholders; size, network; and ecology (Spohrer et al., 2008; Maglio, P.P, Spohrer et.al., 2019). In substance the SS system is a dynamic composition of resources with several actors inside (people, technology, organization, and shared information) that create and transfer value between providers and customers through services (Spohrer et al., 2009). According to the SS, all forms of functions that are named and have functions and roles in a system can be viewed as resources. Entire actors are thus considered to be resources, and all service tools are designed useful instruments for business activities (Mele and Polese, 2010). A service system principally relates to customer-provider interactions as well as an open system (Heinonen, K., et.al; 2010) with it being qualified of developing its function and the one of another system through achievement, sharing or applying resources, with the aim of creating a basis for systematic service innovation.

Therefore, service systems should play and act as resources integrators, coherent in terms of elements in a work system (Spohrer, Anderson, Pass, and Ager, 2008), within the organization and through the network of resource specialization, all of function of operationalization (Vargo and Lusch, 2004), such as knowledge, skills, know-how relationship, competences, people, products, material money, etc. Service systems are effective of build connections and interaction with all involved function within service exchange, ministering technology infrastructure simultaneous which they rely smoothens the communication channel between actors interaction in basic needs of Business to Business (B2B), Business to Consumer or vice versa (B2C/C2B), Consumer to

consumer (C2C), Business to Stakeholder or vice versa (B2S/S2B), Customer to Stakeholder or vice versa (C2S/S2C) (Gummesson and Polese, 2009).

Viable System Method (VSM) Framework

As explained, all functions that play a role in a system will have the ability to integrate with each other in existing cross-functions. Observations made in this study were to see the real condition in Bandung Techno Park. Increasing complex phenomenality affecting business, individuals, government, industries, and all stakes' holders generally decision maker. The interaction relationship includes gaps or things that are not in accordance with expectations which we call gaps in the system. All the attempt to undertake robust and substantial decisions, strategies, behavior seem to fail for the number of factors to take into the variability field of decision. Unpredictable additional factors which, indeed, can influence the decision of any kind of process, development, establishment, and interaction (Saviano, M., Barile, S., Spohrer, J. C., & Caputo, F.;2017)). Viable Systems Model (VSM) developed originally in the late 1960s by Stafford Beer. The VSM is a model of the decisive and sufficient conditions for the viability of systems. A viable system is one that can support its own existence. To do this, it must be arranged in such a manner that it can adapt to the changing demands of an ever-changing environment. One of the primary characteristics of systems that persist is their adaptability. Stafford developed the concept in various papers, most notably Brain of the Firm (Beer 1972) and Heart of Enterprise (Beer 1979) for the theory and Diagnosing the System (Beer 1985) for the implementation approach.

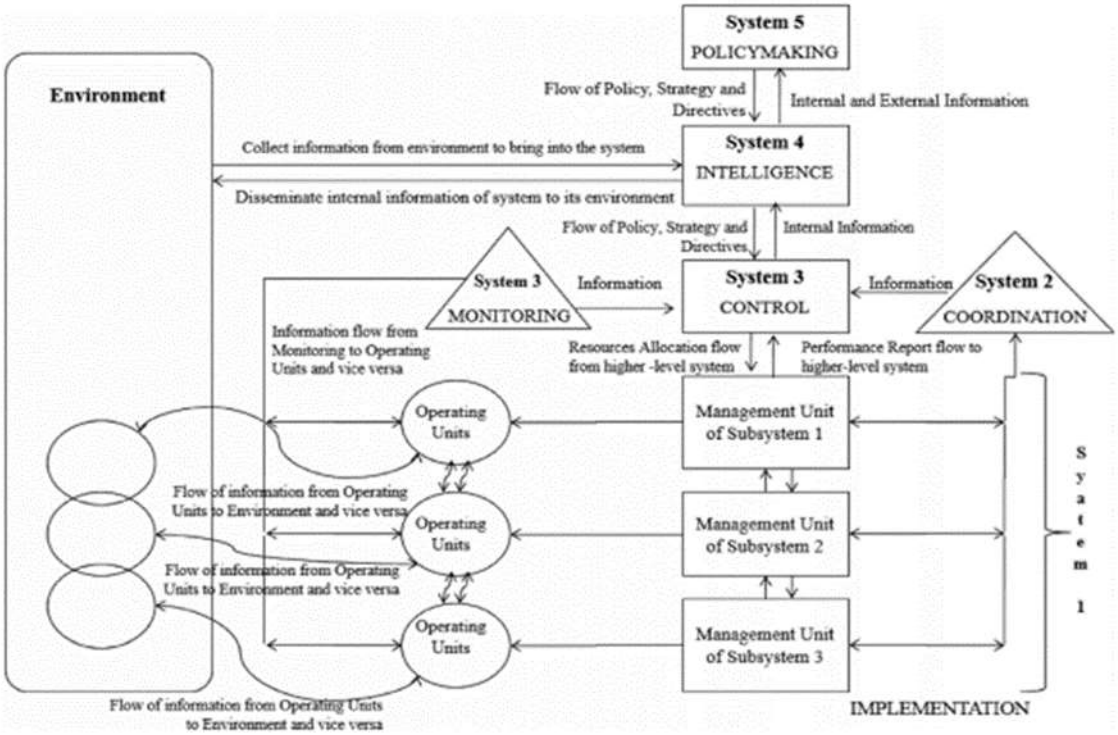

Figure 2. Viable System Method (VSM) Basic VSM framework, with some descriptions of the lines, arrows and shapes. (Sources: Adapted from Beer (1981); Espejo and Gill (1997); Hoverstadt (2008); Khairul Akmaliah (2008), Khairul Akmaliah et al. (2017))

Adopting from M. Reynolds and S. Holwell's book Systems Approaches to Making Change: A Practical Guide, which to be published by The Open University in 2020. Chapter 3 delves into the specifics of the Viable System Model, which was created by Patrick Hoverstadt, an accomplished business practitioner. As previously stated, Stafford Beer discovered and created VSM. When Stafford Beer sought to build the Viable System Model (VSM), he sought to develop a "science of organization" based on the systems and cybernetic principles that underlay all organizations (Beer 1959, 1966, 1974, 1978, 1979, 1981, 1985, 1994). Beer developed a methodical

model for describing how organizations achieve viability, which he defines as the capability to persist and flourish in often uncertain and tumultuous settings. The VSM is provided as a graphical model - a representation of several important components (five subsystems and an environment) that are linked in a certain manner and need viability, as seen in Figure 2. The subsystems are as follows:

Table 1. Five Sub-System Explanation in Viable System Model by Stafford Beer 1994

System 1	The sequence of activities carried out by an organization that add value to its external world, the fundamental operations (System 1 is drawn in the standard diagram above as a set of circles)
System 2	The establishment of activities or guidelines for coordinating operations necessary for coordinating the many operations that cause issues for others (represented by the triangles on the right side of the diagram)
System 3	The managerial actions involved in allocating resources to operational and ensuring they produce the performance required by the organization.
System 4	Management operations must take into account the ecosystem and the futures, as well as development and change, with the objective of promoting the organization's growth.
System 5	The collection of managerial activities that enable the organization operates as a system, specifically that decision-making between Systems 3 and 4 is reliable, as well as that the organization's identity is managed to maintain and supported, and that activities implemented are consistent with acceptable practice as policy, which is generally referred to as governance.

Technology-Based Business Incubator

The role of business incubation has to be examined in the overall framework of small enterprise creation mechanisms and business development services under conditions of change (Hackett, S. M., & Dilts, D. M. ; 2004). The role of business incubation has to be investigated in the overall framework of small enterprise creation systems and business development services under circumstances of change offers expanding opportunities for start-up that can anticipate and organize for change (Feldman, M., Francis, J., & Bercovitz, J.;2005). It is also a challenge for planners, educators, research managers, and technopreneurs, to restructure the knowledge systems and better provide their community and its innovators to acknowledge to the reality of the new marketplace (Lalkaka, R.; 2006). The primary purpose of an incubation center is to encourage new businesses (startup) succeed and create wealth and employment opportunities, that what we called value co-creation instead (O'Hern, M. S., & Rindfleisch, A.;2010). Incubators also help their clients/tenants overcome the barrier and regulatory hurdles to accelerated business formation by facilitating the start-up process and through access to a community support network (Almoli, A.;2018). Specific objectives, depending upon the incubator's focus, may include:

Table 2. Type of incubators focus, Source: Rustam Lalkaka, 2005

Technological innovation	Through interaction with universities and research networks, for initiating and launch innovative products, processes and services to domestic and export markets, also for product-market-technology validation.
Regional development	Distribute economic activity away from urban concentrations, organize local resources, and enabling informal businesses to move into the formal sector.
Industrial subcontracting	Linking up the integration with industrial estates, facilitating the downsizing/privatization of clustered type of business, and providing specialist components to them and opportunities for 'spin-offs'.
International outreach	Helping foreign companies to quickly enter the domestic market with local partners, or to use the incubator as a base to export to third-country markets.
Targeted development of special groups	Such Information Communication Technology specialist, agribusiness, etc.

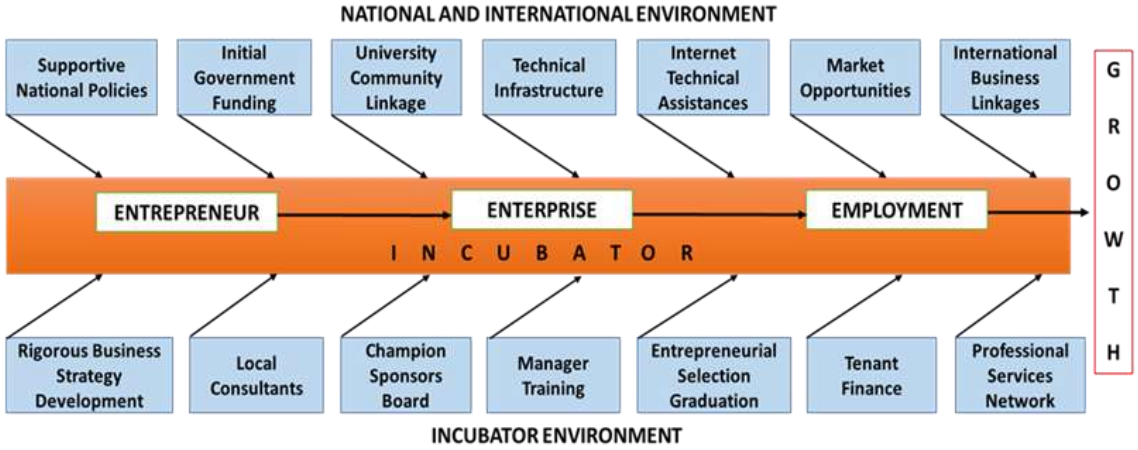

Figure 3. The Functioning of Business Incubator Organizations by Michael Lazarowich, M. John Wojciechowski, 2002

Figure 3 provides an explanation that the role of the incubator in creating a new economy is generally funded by venture capital companies, or established by multidisciplinary consultants who have various interests, and offer support services in the form of technology, mentoring, mentoring, consultancy to managed tenants. The main objective is often to return the investment that has been given to shareholders and has not guaranteed the sustainability of the business they manage. The high risk of running a business often results in failure during the early stages. Common best practice analyzes show that incubators should not be treated as stand-alone operations but need to be integrated into other stakeholder networks, schemes for collaborating to promote innovation, enhancing competitiveness and technology transfer processes and aiming at influencing public policy other major.

III. Research Methodology

This study aims to analyze the findings of exploratory and field observations using a qualitative approach. This effort is carried out as a type of applied social research, which analyzes social experiments by attempting to introduce the BSM system scheme to business incubator managers and monitoring its effects. The object being analyzed in this case is all of the elements represented in each of the systems that will be explained. Managers of incubators and other stakeholders are involved. Each role examined serves as an input for VSM's system conceptualization. The primary reason for using qualitative research methods in this study is that the first stage is to identify problems, find the causes of problems that occur, if any, and discuss things that are so dynamic that they can be done more quickly in the field. Every stakeholder has a vested interest in providing a signal resulting from identifying problems at each stage of the system.

Collaboration among all stakeholders is demonstrated by establishing a network of mutual understanding between researchers and related parties, which will increase collective awareness, making it easier if something changes, both in terms of systems and methods—for example, the startup coaching system and effective and optimal business management. The principle of collaboration, flexibility and open communication from all stakeholders may be a source of objective observation of the existing research plan. If this is the case, dynamic changes in the situation can be carried out in an excellent anticipatory manner by the company under consideration.

The data used in this study are observations from previous studies that discuss the business incubator process in universities to develop technology-based entrepreneurship. In this study, the Viable System Model will be used to analyze the feasibility of a business process that integrates more systematically with various internal and external parties of the university. From mid-2018 to mid-2021, a series of observations were made. Structured semi-qualitative interviews were conducted with stakeholders from the current environment, BTP managers, and several tenant representatives from business incubators. It is necessary to see the two-way relationship between the incubator as a service provider at BTP and the startups that act as incubator tenants. During the observation period in this study, 13 people were obtained as informants, 6 of whom were directly involved in the service activities provided by BTP as an essential structural element in the organization at BTP. They are the directors of

Bandung Techno Park, the managers of innovation and business incubation, the assistant managers of business incubation and entrepreneurship, the assistant managers of innovation, and the experts. They founded Bandung Techno Park as a technology-based business incubator. This research is supplemented by successful interviews with seven Business Start-up tenants who are still active at BTP and serve as resource persons for processing and reviewing essential data for analysis and research findings.

The observation report is not only in the form of interview results, but it is also supplemented by descriptive field data to strengthen the information from the interview results and provide accuracy and protection for the various information provided by the informants. In terms of the stages used to map the interview results onto the VSM framework, the researcher conducts interviews that control the storyline so that informants can indirectly explain the process flow based on the system that is set to adjust VSM. The interview results are then reported. A coding process is used to determine the mapping of the results of open coding, axial coding, and selective coding. According to the conceptual framework of the Viable System Model, selective coding is chosen as the expected representation in this study's analysis.

IV. RESULT / FINDING

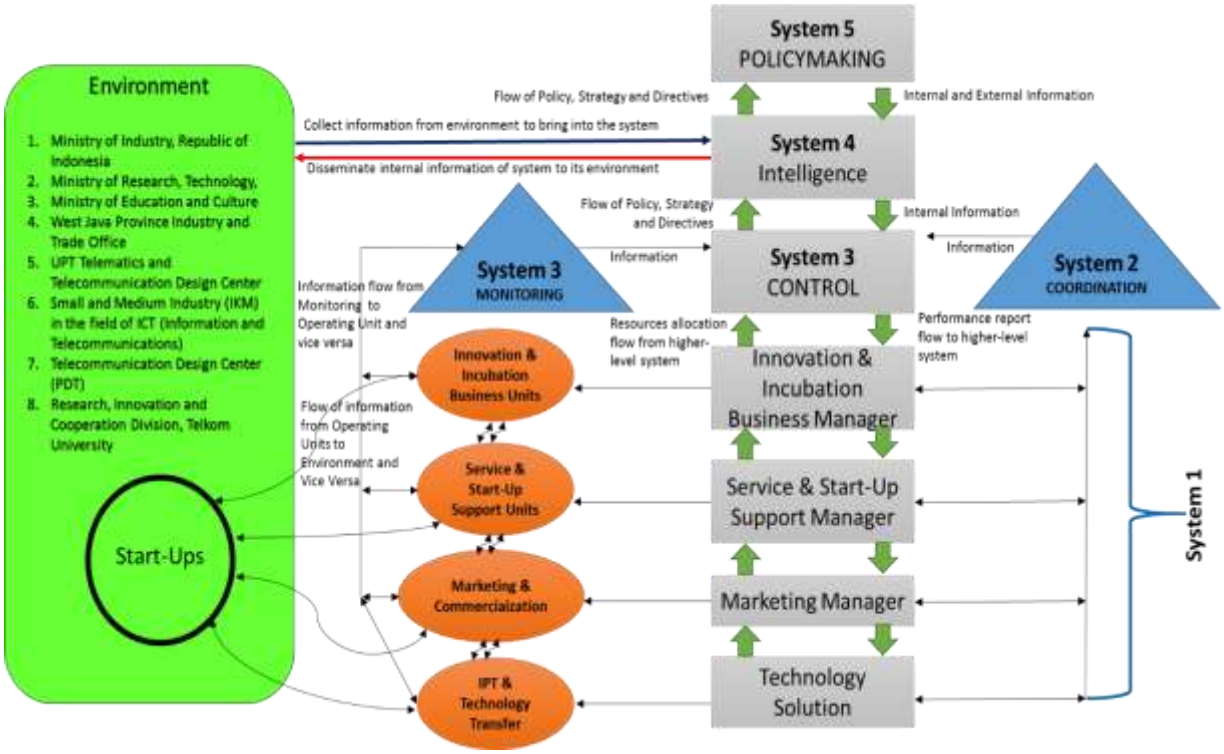

Figure 4. Viable System Model as A Framework for Value Co-Creation Service System Analysis of Technology-based Business Incubator

V. DISCUSSION

Analyzing Bandung Techno Park using Viable System Model

According to Viable System Model, there are five serviceable factors that identify organization performance. In order to develop improvement, VSM can be used to engage in internal problems by enhance goal settings of the organization and its fundamental identity.

System 1: The Operation. There are four operational parts in Bandung Techno Park. The main role played by executors at Bandung Techno Park. The responsibility for this actor is to carry out operational duties to implement (1) Prepare guidelines for the acceptance of Start-Up tenants. Incubated by paying attention to the potential for innovation that can be developed and the potential that is owned if Participating in the technology-based business

incubation program at BTP, (2) service and start-up support, which is assigned to Ensure physical and non-physical services that can be provided to start-ups as tenants during the incubation period Functioning well, (3) Marketing manager, which facilitates to bring together start-up tenants with potential buyers of the product and The results of the innovations they create, usually facilitated by a demo-day event, a special day for start-ups to demonstrate products and technology. What they create in front of prospective users, buyers and investors, (4) Technology solutions, whose task is to provide solutions in technology development that are felt by tenants to be an obstacle to being accepted by the market and need special efforts for the technological diversity of the products they create.

Operationalization carried out in system 1 defines all stages of initial activities that occur at the beginning of BTP to open opportunities for tenants to join the technology-based business incubation agenda. Call for tenants, which is opened only once a year, requires the team working in this operationalization section to work systematically. The stage of building the interest of start-ups to join the technology-based business incubator at BTP begins by often holding seminars that build the theme of technology-based start-up development. System 1 is what ensures the recruitment stages are in accordance with predetermined criteria. Criteria include a capable team, real ideas for a problem, solution fit, prototypes and market opportunities. However, the standards are adjusted annually to the condition of the registrant startup. These criteria are set by the internal incubator which involves the role of the team in System 1.

System 2: Coordination. At this stage, the indicated system is the coordination between the management of the incubation organizer at Bandung Techno Park and several parties who have an interest in the incubation process. Real conditions in the field BTP coordinates with internal parties to ensure information that needs to be integrated into System 3 (Controlling). The internal parties referred to are all faculties at Telkom University which consist of seven faculties (Faculty of Business Economics, Faculty of Industrial Engineering, Faculty of Business Communication, Faculty of Electrical Engineering, Faculty of Informatics, Faculty of Creative Industries, Faculty of Applied Sciences). This is important for coordination to ensure that the faculty can become tenant feeders for technology-based business incubation activities scheduled by BTP. Another internal party is PPM as a center for research development and community service under the Research, Innovation, and Cooperation Division, Telkom University. The coordination is to obtain information on research potential that can be developed into the application of innovative technology that has business value in the future.

System 3: Control. In system 3, the main control function carried out by BTP as a service provider to tenants is to ensure two-way information that occurs between industries, BTP as the center of incubation activities with its agenda, and with start-up tenants. The role of control is as a bridge between ICT education institutions and the industrial world. In this case, coordination with system 2 which refers to Telkom University as one of the higher education institutions in the field of information technology and national telecommunications has the ability and number of human resources to develop applied research that can be utilized by the wider community. Likewise with the control function to build relationships with the Ministry of Industry of the Republic of Indonesia to develop the Telecommunication Design Center (PDT), the Ministry of Education and Culture, the Ministry of Research and Technology, and other external parties. This 3-way information will form a synergy showing an integrated work pattern both internally and externally to BTP.

System 4: Intelligence. The Government of the Republic of Indonesia strongly supports the activities carried out by the Telkom Education Foundation at Telkom University by establishing the Bandung Techno Park, Ministry of Research, Technology, Ministry of Industry, Republic of Indonesia, Ministry of Education and Culture, Research, Innovation and Cooperation Division, Telkom University, UPT Telematics and Telecommunication Design Center, Telecommunication Design Center (PDT), Small and Medium Industry (IKM) in the field of ICT, West Java Disperindag. The government through the Ministry of Industry provides a forum for research, innovation, and incubation of digital industrial businesses, one of which is Bandung Techno Park (BTP) which was inaugurated on January 16, 2018. To realize the great ideals of the government for Indonesia which is projected to become the largest digital economy country in ASEAN with 1,000 technopreneurs, a business valuation of USD 100 billion, and an e-commerce value of USD 130 billion. This requires the integration of all systems involved in order to collect information from the environment to bring into the system. And a two-way relationship by conveying dissemination, both internal and external, systematically to the existing environment.

System 5: Policymaking. The policies that have been set as the main foundation of Telkom University, which is a private educational institution that owns Bandung Techno Park, have been listed in the Telkom University Development Master Plan for 2014 - 2018 in the Decree of the Telkom Education Foundation Board of Directors, Kep. 1068/01 / SET-04 / YPT / 2014. The plan clearly states the policies governing the stages of Telkom University to become a world-class university with efforts towards a Global Entrepreneur University. The master

plan also explains that human resources owned by Telkom University, who act as lecturers, must be able to become mentors and partners for start-up companies resulting from the incubation process on a national, international and global scale. To achieve the vision of becoming a national excellence entrepreneurial university, the number of start-ups produced at the national, international, and global levels is also a policy that binds the performance of Bandung Techno Park to realize these goals.

The big agenda of this policy cannot be separated from the integration of System 1 from the operationalization stage of preparation, System 2 which coordinates all the actors who play a role, System 3 to always control and monitor each stage of activity, System 4 which ensures everything runs harmoniously according to with their respective roles, and System 5 which is guidance in the form of policies that have been established to carry out long-term plans for Bandung Techno Park.

By integrating the theoretical framework into the model built from a VSM perspective, it is anticipated that this methodology will be capable of resolving systemic dilemmas while also serving as an integrative approach to resolving problems that arise in complex systems (characterized by interdependence, mutual interaction, feedback information, reciprocity). return). across systems) from the first system to the fifth system operational definitions. Because VSM can translate theory into "action and application," we will develop a model that will enable us to capitalize on the benefits of shared value creation as it occurs in technology-based business incubators, which can then be applied to specific cases and simulated for additional quantitative insights. However, another way to explain system interactions when applied to action research is to adopt the soft systems methodology as a cyclical learning system that uses a human activity model to explore with actors their perceptions of real-world problem situations and their willingness to choose a purposeful course of action that accommodates the dynamic perceptions, judgments, and values of different actors.

Role of Technology-based Business Incubator in Value Co-creation: Extended analysis

With structured activities carried out by Universitas Telkom together with Bandung Techno Park to carry out advanced research that produces new knowledge and intellectual economic value products, it is a forum that shows the role of BTP as technology. -based business incubator who is able to become a facilitator to create value co-creation. The results of research that start with ideas and discoveries are then developed in the faculty laboratory, through the results of research can become products and services that have potential business value. The steps to provide guidance to business star-ups in a very short incubation period of one year require maximum service integrity until the incubation graduation period is achieved according to the target. The value co-creation process that occurs also shows three different schemes. The three of them are unique and have good potential to direct start-up businesses with promising market potential.

In the incubation stages experienced by business startups, from the early stage to graduation, there is a trend in the relationship between BTP as a service provider and Start-up as a customer. This reciprocal relationship becomes a trend toward interconnected that need to re-evaluate of the role of relationship in business competitiveness and survival. There is a growing recognition thar relationships represent distinctive ad valuable resource that should be carefully developed and maintained. The adoption of such a service-oriented framework in business models and management strategies has fundamentally alerted the way in which business related to the market in the modern service economy (Rullani, 1997; Gronroos, 2000). The relational nature of service is also apparent in the concept of a "technology solution" in System1 and System 2. These activities can be understood as a complex agenda to find physical resources, new technology innovation, commercialization of the system of service providers. This can be seen clearly in the interactions that occur between business start-ups as tenants who need to find technology development solutions to find the customer's needs. Based on this perspective, a “service-solution” involves the activities of many actors within co-creation logic (Prahalad and Ramaswamy, 2004; Vargo et al, 2008). So, the results of the observation of this study also found that service can be understood as an interaction between entities in a reticular system to provide room for improvement for the value co-creation process which produces a win-win logic of the interrelated process relationship.

Limitation

This investigation was conducted in Indonesia from mid-2018 to mid-2021. Because the world was through a Covid-19 pandemic at the time, it was considered that the exploration and observation procedure on study objects was inefficient and had numerous constraints. The field observation process is still perceived to be deficient and imprecise, particularly during the exploration stage of the following stages: System 2 – Coordination; and System 3 – Controls. How organizational groups interact should be made more visible and thoroughly analyzed at these

two levels. From a service science perspective, the critical functions of each level of the system can be classified more precisely. It is critical to envision the future of long-term policy strategies for technology-based business incubators.

VI. CONCLUSION AND RECOMMENDATION

1. Using the Viable System Model (VSM) approach, this research will be able to dig deeper into each existing system unit. This notion can be applied to evaluating university and faculty business incubators in general. More research is needed to investigate each group of systems using a more comprehensive and deep service science methodology to improve services in technology-based business incubators, according to the findings of this study.

2. The analysis of the two-way relationship that exists between start-ups as tenants and BTP as business incubators, as well as other systemic actors involved in the ecosystem, shows that this feasible system model can provide an analysis of the two-way relationship that exists between start-ups as tenants and BTP as business incubators.

3. To establish value co-creation in technology-based business incubators such as BTP, at least it is necessary to have an open system that has characteristics that take into account many components (both tangible and intangible); interdependence and building a good communication pattern for each component, activating the relationship of both individuals and organizations and institutions can all be understood, as a system consisting of elements that are directed at certain goals.

4. Figure 4 which shows the concept of the relationship between System 1 to System 5 describes a hierarchical system that can provide identification on what system business incubation performance should be able to follow its role to build an open system.

5. The results of this study recommend that future research on technology-based business incubation centered on universities should focus on the interactions between potential actors in interaction throughout the incubation period, sector-specific resources, and it is important to examine how the network of these various actors can lead to sustainable competitiveness.

6. The conceptual VSM model can be applied not only to technology-based business incubators, according to the findings and analyses of this study. The development of technological adaptive capability in each feasible system is a critical topic to consider while conducting general and specific system evaluations. The university incubator, the independent commercial incubator, the regional business incubator, the company-internal incubator, and the virtual incubator should all be used to test the notion of evaluating this service system.

7. Further research should investigate the critical function of very dynamic public policy in defining the scope of the service system offered, as well as how it may be used as a metric for the quality-of-service systems in a more professional business incubator.

8. Physical service facilities do not always have to be a criterion for the success of tenant transactional services. This study suggests how technology-based business incubators might build a long-term and sustainable pattern of collaboration in an ecosystem that contributes to Indonesia's economic growth, scientific progress, and transformation into a center of sustainable innovation.

9. Future research recommendation is possible to employ collaborative partnerships in the form of persons, groups, and institutions to serve as a reference for future study. In service science, the most important notion is that it provides facilities for the formation of transactional linkages between various disciplines, which is the most important foundation for being able to study any system.

10. Another approach to discussing system interactions in action research is to use the soft systems methodology as a cycle learning system within ecosystem that engages a human activity framework to investigate with actors their conceptions of real-world problem contexts and their eagerness to choose a premeditated course of action that accommodates the interactive perceptions, decisions, and values of different stakeholders.

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