

THE ROLE OF LEADERSHIP THROUGH POLICY NETWORKING IN THE DEVELOPMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY INNOVATION AT BANDUNG TECHNOPARK

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Abstract - The presence of Bandung Technopark (BTP) supports government programs in Nawacita, RPJMN 2015-2019, Presidential Regulation Number 106/2017 concerning Science and Technology Areas, as well as Law Number 11/2019 concerning National Science and Technology Science and Technology. The development of ICT innovation through BTP cannot be carried out individually by one party alone, but the presence of other parties is highly expected. In the last 13 years, BTP has proven to have a positive impact by producing various innovative programs that continue to develop. One of the critical factors in the development of Technopark is leadership. This research uses qualitative methods by collecting data through interviews, observation and documentation of BTP informants. The research results show that the actors involved involve six actors. Each actor performs functions with good structural coordination, effective action rules, adequate institutionalization, and balanced power relations. Strategic actors in the form of collaboration, so that the leadership role that encourages creativity, provides support, and builds partnerships make BTP superior value in developing ICT innovation through BTP.

Keywords: ICT; Innovation; Leadership; Policy Networks; Science Techno Park.

INTRODUCTION

Improving technological development cannot be separated from the innovative contribution of researchers in Information and Communication Technology (ICT). Technological developments will continue to develop from year to year. The presence of information technology functions to facilitate human work but is not limited to just corporate but can be individual (Rahmadoni et al., 2022). Through the Central Statistics Agency (BPS), the Indonesian government measures ICT development at the provincial level in Indonesia. The report (Badan Pusat Statistik, 2022) states that the Indonesian ICT Development Index 2022 is 5.85. This index increased from the previous year, namely 2021, amounting to 5.76 on a scale of 0-10. The assessment consists of three sub-indices: the access and infrastructure sub-index, usage sub-index and skills sub-index. One of Indonesia's provinces with high economic mobility is West Java, which received a medium category ICT development index (IP-ICT) score of 6.16 points in 2022. Of the three sub-indices, West Java has the lowest skills sub-index. These results indicate a need to increase expertise in ICT innovation in West Java. One of the government's programs to overcome this problem is establishing a Science Techno Park (STP) in Indonesia. Apart from that, to accelerate the growth of innovation and new businesses by providing business incubation for technology-based start-up companies, which takes place in the Technopark (Tricahyono et al., 2018).

The foundation of STP in Indonesia was motivated by the National Medium Term Development Plan (RPJMN) 2015-2019, Law (UU) Number 11 of 2019 concerning the National System of Science and Technology and Presidential Regulation Number 106 of 2017 concerning Science and Technology Areas. One of the pioneer universities that established a technopark was Telkom University, namely Bandung Technopark (BTP). BTP was established in 2010 to build collaboration between academics, business or industry, government and society. BTP has 3 (three) principal components, namely: (1) professional management consisting of research and teaching staff at Telkom University, (2) training/workshop services that run pretty well in the ICT field, and (3) business incubator to manage startups initially for Telkom University graduates. (Muhammad, Faisal and Anindito, 2017) said several components of BTP have been completed. However, one other component, namely the source of knowledge, still needs to be implemented optimally. The importance of the components in



establishing a technopark lies in their contribution to providing a positive impact on users of the facility to develop the ideas, knowledge and insights that users have.

The latest technology has given birth to new potential in the form of organizing so that ideas and innovations can be conveyed well to the broader community. (Maryati and Siregar, 2022) said that leadership has a significant influence on organizational performance. In addition, it was found that Information and Communication Technology (ICT) Innovation acts as a link or mediator in the relationship between leadership and organizational performance. In the Industry 4.0 era, leaders must adapt to the organization's needs. That is why it changed the traditional leadership style to digital leadership, from traditional to more technology-oriented. An effective leader can inspire team members to struggle and actively preserve ideas and innovation. In addition, technological developments encourage management to continue to innovate and influence the effective use of systems, which can be an essential factor in the decision-making process (Klovienė & Gimzauskiene, 2015). (Aldianto *et al.*, 2018) there are several essential factors for developing STP in the 4.0 era; one is the leadership role, which must have a vision, mission and entrepreneurial mindset to bring STP to achieve its goals from the RPJMN. Setting up an STP may be relatively simple, but maintaining and operating it can be much more challenging. In a business context, the development of ICT innovation can provide a significant competitive advantage. Therefore, the role of leaders is crucial in advancing ICT innovation to ensure the success of an organization. Previous research shows that research has yet to explain the role of leadership based on policy network theory in developing ICT innovation in BTP.

This research uses a policy network approach to examine leadership's role in developing ICT innovation at BTP. BTP has been established for 13 years and has had a positive impact by developing several programs that continue to innovate today. A policy network can be interpreted as a relationship resulting from collaboration between government actors, society and the private sector. Leaders can be an essential factor in encouraging ICT growth. With a policy network approach, we can understand the relationships between actors and their level of interdependence. Aspects possessed by a leader can ensure strategic goals, explore and utilize energy resources, create an environment that encourages members to achieve optimal performance, facilitate effective communication, and make the right decisions. The policy network approach is an analytical method used to examine the relationship between policy actors and all the resources and interests they have, both in the implementation and policy formulation stages.

METHODS

1. Bandung Technopark (BTP)

Bandung Techno Park (BTP) is one of Indonesia's largest STPs and a centre for quality ICT development. BTP was founded on January 19, 2010, and during the 2010-2012 period, BTP was part of the Telkom Institute of Technology. Furthermore, in 2012-2018, BTP was under the Telkom Education Foundation's (YPT) authority. Since 2018 until now, BTP has been part of Telkom University. BTP has an organizational structure to support it operationally, as shown in Figure 1. BTP is a community institution aiming to be a centre for developing technological innovation so that ICT resources are created and have competitiveness and the potential to become competent in the current era. BTP has several innovative products that have entered the commercial market, namely startups, industrial collaborations, and quadruple helix, since its founding in early 2010. BTP aims to produce innovative products, give birth to startups, and commercialize research results.

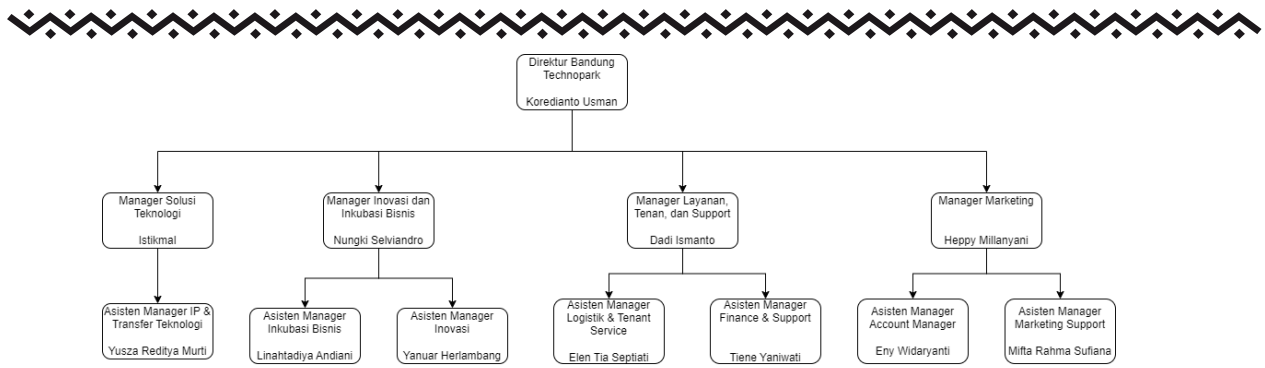


Figure 1: Structure organization of BTP

2. Concept of Leadership

Leadership is a process in certain situations and conditions of individuals who influence the behaviour of other parties individually and in groups so that they can take care of and serve other people and subordinates of society to develop and prosper (Ratna et al., 2017). Leadership is a transformational role carried out by someone towards their team members to share performance responsibility and provide efficient guidance. Leadership aims to carry out tasks per the directions given, hoping to achieve the desired results for an organization. A leader must also have managerial functions to carry out his role optimally. (Badu and Djafri, 2017) stated that the managerial function of leadership includes implementing, planning, evaluating and preparing reports within the organization. Apart from that, leadership motivates each member to work actively and diligently, guides members in carrying out their responsibilities, creates a harmonious work environment, organizes management tasks well, drives member creativity, and maintains good relationships with other parties.

3. Information and Communication Technology

Information and communication technology is any form of technology that can help humans create, change, store, communicate or transfer information (Munir, 2008). Meanwhile, based on the opinion (Darimi, 2017), communication and information technology include delivering, storing and manipulating information through specific media or tools. ICT helps send information data in touch, whether one-way or two-way, involving information obtained directly or indirectly. Based on these two opinions, information and communication technology includes technical equipment for processing, managing data and conveying information.

4. Policy Networks

Many researchers have researched and understood the concept of policy networks and what aspects they contain. In this study, researchers used Waarden's policy network concept (1992) as a policy networking tool because it includes seven observation dimensions that are considered more comprehensive. Warden (1992) introduced seven dimensions, namely:

- Actor, related to the number of people involved (participants). This factor then determines the size of the network to be built
- Function depends on the actors' needs, intentions, resources and strategies.
- Structure: The policy network's structure refers to the relationship pattern between the actors involved.
- Institutionalization refers to the formal characteristics of the network and its stability. (BTP institution).
- Rules of conduct (rules of action), formed by habits or rules of the game in interactions that regulate exchange in a network.
- Power relations are a distribution function of resources and needs between actors and organizational structures when the organization is involved.
- Actor strategies, often using networks as a strategy to manage interdependent relationships. Actors create or use networks to obtain their needs, interests and goals.



5. Research Instruments

In this research, the researcher acts as a research instrument. Researchers conduct surveys directly in the field, starting from ground tour questions, focused selection, data collection, analysis, and making conclusions. Researchers carry out validation related to readiness to conduct research before conducting a survey directly in the field. The validation process that researchers carried out was an understanding of qualitative methods and mastery of insight into the objects studied, namely the role of leadership, policy networks, and the development of ICT innovation. Table 1 displays a grid of research instruments created to make it easier for researchers to conduct interviews.

Table 1 Research Instruments

Observed phenomena	Dimensions	Index
The role of leadership in developing ICT innovation at BTP using a policy network approach	The effectiveness of the leader's policies	Policy material owned by the leader
	Actor relationship management	1. Actor involvement 2. Two-way communication between actors 3. Collaboration to complement each other
	Execution accuracy	1. Maintain interdependence and cooperation 2. Resource management 3. Maximizing mutual benefits

6. Data Collection and Analysis Techniques

The research was carried out using qualitative research, which is descriptive and tends to use analysis with an inductive approach. Data collection techniques are the most strategic stage in research, which aims to obtain data (Sugiyono, 2009). Researchers' Data collection techniques include interviews with sources, observation and documentation. Interviews are conducted in a two-person meeting to exchange ideas and information regarding a particular topic through a question-and-answer process (Sugiyono, 2009). Interviews were conducted using structured interviews related to the role of leadership and development of ICT innovation through BTP with a policy network approach. Next, carry out observations to observe the policy network directly with communication activities, cooperation and involvement of each actor in the development of ICT innovation at BTP. An equally important stage in data collection is documentation. The documents collected in this research are leadership role documents, portraits of ICT innovation development activities at BTP, etc.

After collecting the necessary information data, the next step is data analysis. There are techniques for analyzing data, namely data reduction, data presentation, and conclusion (Sugiyono, 2014).

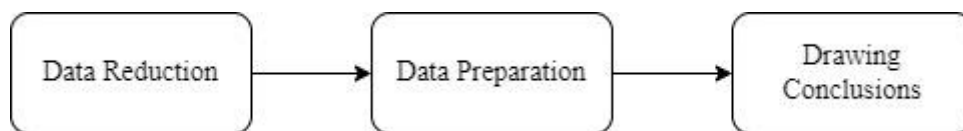


Figure 2: Activities in data analysis

Data analysis activities start from data reduction, where the author discusses with colleagues or other parties with expertise in the related field. Through this discussion, the author can develop the author's insight, which will provide positive things in the form of knowledge in reducing data so that it has significant discovery value and theory development (Sugiyono, 2014). The next stage is presenting the data by displaying a structured information collection, which allows for drawing conclusions and taking activities. The process of concluding is an explanation or description of an object that previously may not have been clear. This understanding in research can range from causal



or interactive relationships hypotheses, and theories. These findings can be used as reliable conclusions if supported by comprehensive data.

RESULTS AND DISCUSSIONS

1. General Condition

Every region in Indonesia has its problems. One of the problems facing West Java is how to reduce the unemployment rate. Based on data released by the Indonesian Central Statistics Agency (BPS), West Java's unemployment rate is in second place among several provinces on the island of Java as of February 2023. This figure can be seen in Table 2. The government has taken the initiative to reduce Indonesia's unemployment rate. The government aims to improve people's welfare, developing programs under the employment service that focus on training workers to get jobs in the formal sector (offices) or starting their businesses.

Table 2 Unemployment rate on Java Island

Province	Unemployment Rate in February 2023	Order
Banten	7.97%	1
DKI Jakarta	7.57%	3
West Java	7.89%	2
Central Java	5.24%	4
DI Yogyakarta	3.58%	6
East Java	4.33%	5

One business that can be done is establishing a startup. In establishing startups, the government collaborates with universities by establishing technoparks. On the other hand, universities must fulfil the Tridharma of Higher Education, namely providing education, research and community service in accordance with Law Number 12 of 2012 concerning Higher Education. Therefore, the government and universities work together to provide job training and formulate policies. The government developed ICT innovation for the community through BTP from this condition.

1. Policy Network Model in BTP

An analysis of the role of leadership in BTP has been carried out using a policy network approach using seven main dimensions of policy networks in accordance with (Van Waarden, 1992).

a) Actor

In formulating a policy, actors are related to the number of people or participants involved. This dimension determines the size of a network that will be built. Actor involvement in this research can be seen in Table 3.

Table 3 Distribution of actors in BTP

Actor	Institution
Government Elements	National Research and Innovation Agency
Academic Elements	Telkom University
Community Elements	Bandung Technopark (BTP)
Business and Industrial Elements	Telkom Indonesia
Community Elements	Startup

Based on the results of observations and interviews, researchers see that those involved in developing ICT innovation at BTP consist of 6 (six) elements, namely the government represented by the National Research and Innovation Agency (BRIN), academic elements, namely Telkom University, community elements namely BTP, elements business and industry, namely Telkom Indonesia, and the community element is startup. From the data obtained, BTP uses the quadruple helix concept, where there is a collaboration between government, academics, business and community. The government acts as a

policy maker, universities act as research developers, the industry as a provider of community service needs to achieve common goals, and society acts as a product user.

b) Function

The function dimension can be interpreted as everything that actors do as a communication channel between one another, which is in accordance with the needs, interests, resources and strategies of the actors involved to achieve common goals. Networking can be connoted as a medium that aims to shape the flow of communication so that it can be illustrated into several general functions such as policymakers, policy implementers, facilitators, consultations, and instruments for cooperation between actors. Table 4 displays the function of each BTP actor using a policy network approach.

Table 4 The function of each actor in BTP

Actor	Access to Decision Making	Information Exchange	Resource Exchange
Government	Policymakers and implementers	Have	Carry out regulations
Telkom University	Policy implementer	Have	Provision of human resources, curriculum and sources of innovative products
Bandung Technopark	Policy implementer	Have	Providing facilities to improve business capabilities and ensuring commitment between collaborating parties
Startup	-	Have	Application of information and communication technology innovation in society

The exchange of information in the policy formulation team takes place in two directions through meetings of the formulation team, which are attended by three actors, namely the Government, Academics and BTP. The government's functions include making regulations, while Telkom University is a provider of academic human resources interested in implementing business, curriculum and innovative products. Bandung Technopark plays a role in building cooperation between academics, business, industry, government and society. It also includes providing facilities to improve business capabilities and ensuring ongoing involvement and commitment between collaborating parties.

In addition, the role of the media aims to emphasize Business Incubation Education, including exposure activities and facilitating interaction between content creators with the aim of publishing to the press. On the other hand, community involvement allows Bandung Technopark to evaluate its programs, improve progress, and develop variations owned by different communities.

c) Structure

The structural dimension of policy networks refers to the pattern of relationships between the actors involved. Government actors dominate the network structure in developing ICT innovation within BTP. The government has a mandatory membership type, including coordination, facilitation and consultative functions. Therefore, the government has carefully regulated the duties and functions of each sector, avoiding overlap in the implementation of the duties and functions of each party. The membership type can be mandatory or voluntary, depending on factors that determine whether actors consider this network a challenge or opportunity in efforts to develop Information and Communication Technology (ICT) innovation through BTP institutions. However, in the coordination category, all actors have a similar type of coordination, namely consultation. In this form, all actors can share ideas, provide input, and provide suggestions between fellow actors so that the relationships formed are cooperative. On the other hand, start-up actors are not involved in coordination because their membership is included in the voluntary category. More clearly, the structural dimensions that occur in BTP can be seen in Figure 3 and Table 5.

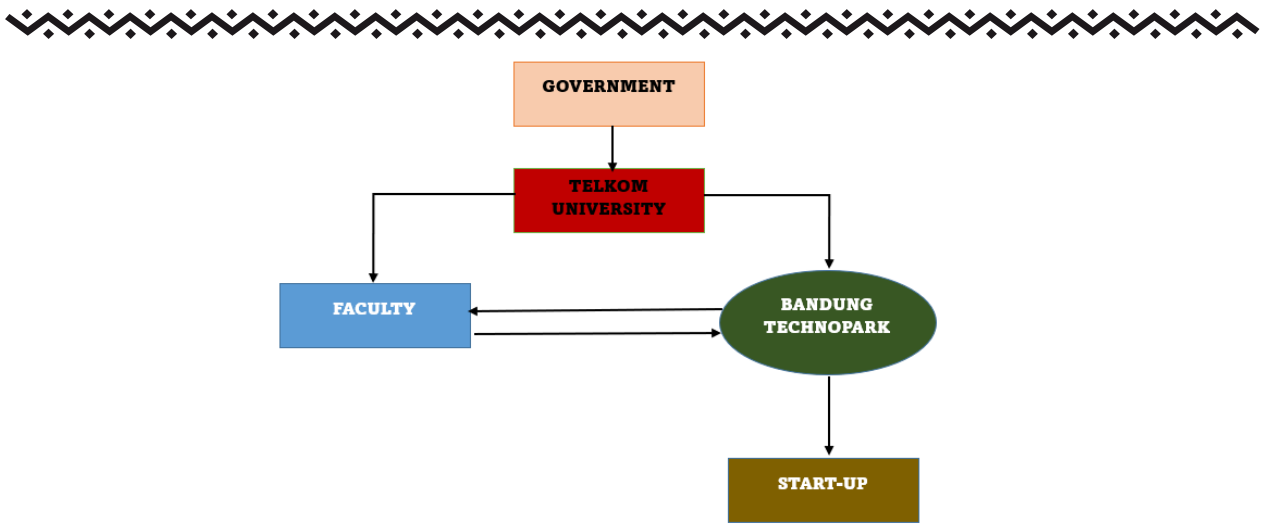


Figure 3 Network structure for ICT innovation development at BTP (Source: Author)

Table 5: BTP policy network structure

Actor	Membership Type	Coordination Type	Relationship
National Research and Innovation Agency (BRIN)	Mandatory	Coordination, facilitation and consultative	Cooperative
Telkom University (Faculty of Business Economics)	Mandatory	Consultation and facilitation	Cooperative
Bandung Technopark	Mandatory	Consultation and facilitation	Cooperative
Startup	Voluntary	-	Cooperative

d) Institutionalization

Institutionalization is a level that reflects a network's formal nature and stability. The concept of institutionalization is closely related to the structural aspects of a network. The institutional structure has proven adequate in efforts to develop ICT innovation through BTP. This can be seen from collaborating with the government to regulate regulations, partnering with universities to provide human resources, designing curricula, and producing innovative products. Apart from that, BTP also collaborates with research and development institutions to provide and develop technological innovation products. Collaboration with start-up partners to help implement ICT innovation in society. In addition, BTP institutions collaborate with professional communities through training, sharing information, experiences and other activities. With the existence of an institutional network structure, collaboration between various parties related to the development of ICT innovation at BTP can be realized. This collaboration is expected to accelerate the ICT development process at BTP and produce superior ICT innovation.

e) Role of Conduct

The rules of the game arise from habits or rules (rules of the game) that regulate the exchange of information in a network. In the context of policy networks, rules of conduct refer to norms or habits that influence interaction patterns between actors within them. These rules of conduct can influence how actors interact and cooperate in policy networks and can affect the results of these policy networks.

For the government, the development of ICT innovation through BTP involves various actors, so it requires continuous coordination between the parties involved. Coordination plays a vital role in policy networks, helping to ensure effective policy implementation. In the context of policy networks, coordination is often achieved through negotiation and consultation between actors. For academics, information exchange is considered a method for achieving common goals. This



information exchange process occurs through formal and non-formal meetings, which support the implementation of ICT innovation development at BTP institutions.

For BTP, regulations resulting from collective agreements provide a basis for each member to obey and work together effectively. This regulation is not binding on all faculties because Telkom University has 7 faculties, not all of which are directly related to ICT. However, because Telkom University's identity is closely related to ICT, the development of ICT innovation is emphasized and developed within BTP. This effort is expected to have a positive impact, such as improving communication, learning experiences and efficiency. In this way, all parties can work together with a sense of shared ownership for the common interest and welfare, supported by openness between one party and another. For startup companies, there are no special regulations applied by Bandung Technopark because startup companies are considered part of the community that participates in developing ICT innovation through the BTP institution.

f) Power Relationship

The close relationship between power relations and power-sharing creates a framework within which resources are exchanged, actors' needs are met, and the structure of interactions within a network is determined. The dynamics of power relations are strongly influenced by interactions between actors and the goals aimed at by the parties involved. The existence of a balanced distribution of power in the network creates mutual dependence between the actors involved, encouraging collaboration, communication and effective exchange of information to achieve common goals.

Table 6: Power relations of each actor in BTP

Actor	Power Relation
Government	The government has a function as a policy designer. It is responsible for ensuring its implementation so that stakeholder groups can feel the performance of the public policies that have been made.
Academic	Through its faculties, Telkom University participates in collaboration by developing innovation and conducting academic studies. This role helps students and lecturers to be involved in developing ICT innovation at BTP. Besides that, universities contribute to the innovation process through research results, academic startups, academic patents, and other student-based initiatives.
Bandung Technopark	Bandung Techno Park is essential in advancing innovation and raising the standards of education and research in higher education. Its function involves: <ul style="list-style-type: none"> • Participation in program planning and development. • Coordinating activities. • Evaluating policies. • Collaborating with faculties and other institutions to create innovative solutions to face various challenges.
Community	For startup companies, their role lies in developing innovation by prioritizing research and development, evaluating ideas objectively, designing measurable business models, creating jobs, and requiring support from the government and society. Therefore, collaboration with innovation development institutions is expected to strengthen the efforts carried out by startup companies.

(Source: Analysis Results 2023)

Table 6 explains in detail the power relationships actors carry out in BTP. So, in developing Information and Communication Technology (ICT) innovation in BTP institutions, power relations involve understanding the duties of each actor. Apart from BTP, academic actors have a crucial role because they provide campus access for industrial collaboration and access to ideas and expertise from students and lecturers. Even though BTP's position has been good, the understanding of field problems is more visible from academics who constantly interact with students and lecturers. Even though there is a faculty visit program, not all students contribute. However, there is no visible dominance of the characteristics of each party because of the interdependence and needs between them.



g) Actor Strategy

Actors' strategy generally utilizes networks as a strategy to manage the interdependence of actors. Actors use networks to meet needs, achieve interests, and achieve goals. The system these parties implement significantly influences the dynamics of the relationship between them; therefore, understanding the strategy implemented by the parties involved is very important.

Table 7: Strategic actors from each actor in BTP

Actor	Strategy for BTP
Government	The Government's strategy in developing ICT innovation through the BTP institution is to continue collaborating through joint work, sharing information and communicating.
Academic	The University's strategy is collaboration and sharing and supporting the achievement of graduate profiles to become entrepreneurs.
Bandung Technopark	The strategy implemented by BTP is to continue collaborative efforts by going to the field and interacting directly with the community, including visiting each faculty to convey information about the existence of BTP and its objectives.
Startup	The strategy that startup companies implement is to continue creating products or services that benefit society.

Currently, Bandung Technopark has established a number of collaborations to optimize strategic potential. Cooperation within the Pentahelix framework aims to develop innovations that have the potential to become products or services with high added value and are sustainable, providing significant benefits to society. Since its founding in 2010, Bandung Technopark has successfully partnered with 54 startups that have contributed to this collaboration. Bandung Technopark also has several program options to produce technology solutions that suit partners' needs, namely:

- a. BTP IP (Bandung Techno Park Incubation Program) or BTIP, also known as SCIP (Startup Coaching and Incubation Program), is a business incubation initiative aimed at startups. This program includes various activities such as business assistance, mentoring, training, workshops, business meetings, and pitching/demo sessions. Participants can also take advantage of other facilities such as co-working space, marketing support, legal support, pre-seed funding, and access to other funding sources.
- b. Wrap Entrepreneurship is a program aimed at students interested in learning about business and aspiring to become entrepreneurs. In this program, students will be involved in building their own business, from idea formulation to implementation, over two semesters. Students will receive guidance from lecturers, a teaching team, and a mentor with business experience.
- c. The Faculty Joint Incubation Program (FJIP) is a business incubation program designed as a collaboration between BTP and Faculties/Departments at Telkom University. This program was created as a platform to understand and experience the early stages of business by identifying problems and potential solutions. Activities in the program include business assistance, coaching, boot camp, and pitching/demo day sessions

2. Leadership Role in BTP

A leader is vital in developing ICT innovation within an organization or institution. The following are several things that have been implemented by leaders in developing ICT innovation at BTP:

- a. Leadership that encourages creativity
Leaders motivate creativity by providing opportunities for every lecturer and student to participate in the decision-making process, as well as providing support for new ideas related to business development. The active involvement of every student and lecturer can stimulate creative and innovative thinking in handling various tasks. This approach is expected to promote the formation of new ideas and unique solutions in a business context.
- b. Leadership that provides support

The attention and confidence given by the leader has a crucial role in building subordinates' trust in Leadership. One form of support provided in efforts to develop ICT innovation at BTP is increasing the profile of graduates so they can become entrepreneurs and providing support for participation in programs organized by Bandung Technopark. This support involves encouragement, motivation and providing the resources necessary to start a business, with the aim of helping graduates gain practical experience and broaden their understanding of the business world.

c. Leadership that builds partnerships

Successful Leadership has a crucial role in achieving the goals of every organization. Influential leaders strive to form networks to build relationships and open opportunities for team members. Leaders provide direction, set a vision, provide motivation and inspiration to team members, and play a role in creating an environment that supports success by promoting communication and collaboration in accordance with the strategies of each party involved.

CONCLUSION

In this research, seven dimensions of the Waarden policy network are used, where these dimensions are used to see the relationship of interdependence between one party and another. There are 6 (six) actors involved in developing ICT innovation at BTP, namely government, academics, business/industry, media and community. Each actor carries out their respective duties, principles and functions. All actors have the same interests and goals, which can be seen in the structural dimension of the development of ICT innovation at BTP, where actors have the same type of coordination, namely consultation, and the nature of the existing relationship is cooperative. The dimensions of the rules of conduct run effectively because the actors carry out their functions well. The form of institutionalization that has been running is adequate due to collaboration with the government, universities, research institutions, startups and professional communities. The distribution of power relations shows a balance between one actor and another. Each actor has their strategy. However, there is one most crucial system, namely to continue collaboration. The leadership roles applied by BTP to develop ICT innovation are leadership that encourages creativity, leadership that provides support, and leadership that establishes partnerships.

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