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Optimizing BTS Development in 3T Sulawesi via Telkomsel's Business Ecosystem Approach

Akhmad Asyraf[1*], Dodie Tricahyono[2]
Telkom University, Jawa Barat, Indonesia[1,2]
greatz.091087@gmail.com[1*], dodietricahyono@telkomuniversity.ac.id[2]

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Abstract

Purpose: Communication services have become a primary need for Indonesian society, especially high-speed cellular data services, commonly known as broadband services through cellular networks. Accelerating the development of underdeveloped regions is mandated in Chapter IV of the Preamble to the 1945 Constitution of the Republic of Indonesia as part of the national aspiration to realize a sovereign, united, sovereign, just, and prosperous Unitary State of the Republic of Indonesia. On the other hand, telecommunications providers in rural areas, especially in 3T regions, face challenges, as the number of customers does not justify the investment costs, resulting in a burden on the company's investment and operations. This research aims to identify the actors involved, understand the interrelationships between them, and provide an overview of the current BTS development business model in 3T areas.

Research methodology: Qualitative methods were used, including data collection through literature studies and in-depth interviews, utilizing an ecosystem mapping approach.

Results: Using a business ecosystem approach, this research succeeded in identifying the actors and interactions between actors involved in BTS development in the 3T region, as well as producing ecosystem reconfiguration as a strategy for optimizing BTS development in the 3T region.

Conclusions: The reconfiguration of the BTS development ecosystem in Indonesia's 3T (frontier, outermost, and underdeveloped) areas highlights significant shifts in the roles and interactions among key actors, despite the absence of new stakeholders. The main actors experiencing changes in their roles and collaboration dynamics include Telkomsel, BAKTI (the government agency), PEMDA (local governments), and Fiberhome. Telkomsel's roadmap outlines a structured approach through short-term, medium-term, and long-term planning phases, reinforcing its leadership in advancing telecommunications services in underserved regions.

Limitations: However, the expansion of cellular networks through BTS construction is still uneven, especially in 3T areas (Frontier, Remote, and Underdeveloped).

Contribution: This research provides recommendations for optimizing BTS development in 3T areas.

Keywords: *3T Development, BTS Construction, Communication Services, Cellular, Ecosystem Mapping*

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1. Introduction

The development of technology in the digital era has significantly affected various aspects of human life (Putri, 2023). Information from around the world can be easily accessed owing to technological developments. Along with the development of technology, the culture and conditions of society will eventually become technology-oriented (Wardana, Fatimah, & Fitrisia, 2024). Every activity that has

traditionally been conducted has now been digitized, such as trade transactions, education, and communication (Wahyudi & Sukmasari, 2018). The culture and conditions of society that have turned into digitalization cannot be separated from the use of the Internet by the community in carrying out activities using various digital platforms (Sari & Diana, 2024).

Telkomsels, as broadband internet network provider companies, are required to continue to improve services to support digital services in Indonesia. The development of cellular technology continues, starting with 1G, 2G, 3G, and 4G technologies, and the implementation of 5G technology in several cities. The 4G technology enables very high data transfer speeds and clear sound quality. This technology also allows users to stream high-quality video and access the Internet at speeds better than previous technologies, so that users can enjoy more interactive data services. In 2021, Telkomsel will become the first operator in Indonesia to launch 5G services. However, owing to the high investment costs of deploying 5G networks and infrastructure support available only in urban areas, the deployment of 5G networks is still limited to several major cities.

With more widespread broadband data access services based on 4G technology in the community, the number of devices that support 4G networks circulating in the community is increasing. A survey conducted by APJII (Figure 1) recorded that in 2022, the number of cellular phone users in Indonesia reached 370.1 million users. This is the basis for operators to continue building broadband networks to ensure broadband access to customers. The large number of mobile phone users (smartphones), which has an impact on the increasing number of Internet users, creates both opportunities and challenges for operators to develop strategies and services for the community. As a broadband Internet network provider, Telkomsel is required to continue to expand Internet network coverage in Indonesia, including in the 3T (Disadvantaged, Frontier, and Outermost) areas.

The challenge of the digital divide in the 3T area is a significant issue in today's digital era. Accelerating the development of less developed regions is part of the realization of the national goals stated in Chapter IV of the Preamble of the 1945 Constitution of the Republic of Indonesia, namely, protecting the entire Indonesian nation and all of Indonesia's spilled blood, promoting general welfare, and educating the nation's life. Accelerating the development of less developed regions is part of the national aspiration to realize an independent, united, sovereign, just, and prosperous Unitary State of the Republic of Indonesia . The geographical area of Telkomsel Regional Sulawesi covers seven provinces: South Sulawesi, Southeast Sulawesi, West Sulawesi, Central Sulawesi, Gorontalo Province, North Sulawesi, and North Maluku. This region is a complex unit starting from a cluster of islands surrounded by vast oceans that spread from the tip of North Sulawesi on Miangas Island to the southernmost part of the Selayar Islands.

In addition to the role of the central government and telecommunications operators, in this case Telkomsel, local governments also take part in helping with the provision of 4G services, as quoted by (Amin, 2018). Local governments play a role in assisting the provision of 4G services by handling problems that occur in the field during infrastructure development, such as the boundaries of village customary rules and traditional cultures that reject the acceptance of new ideologies or technologies resulting from globalization, the process of acquiring land, permitting access to land, and proposed locations for 4G BTS construction in 3T areas.

Therefore, to minimize the risk in the construction of 4G BTS in the 3T area, Telkomsel cannot be used as an operator alone. There is a need for coordination and collaboration between parties from various sectors involved in the business, both internally and externally, called the business ecosystem, as cited by (Noviaristanti & Belo, 2020); (Tricahyono & Purnamasari, 2018). The term 'business ecosystem' includes not only the main supply chain and companies but also other stakeholders, such as industry associations and the government. The business ecosystem consists of all individuals. A biological ecosystem involves all interacting organisms as well as their environment. According to Rozanna and Ahadiat (2023) an ecosystem consists of all living things in a certain area, along with all non-living components in the environment that interact with living things such as soil, water, gases in the atmosphere, and light. There are several components of the ecosystem, namely producers, consumers,

energy flows, and sunlight. As cited by Tanha et al. (2023) ecology and economics share several similarities. In ecology, the currency used in transactions is not a rupiah but the flow of material, energy, and information.

The parties involved in the development of 4G BTS in the 3T area, such as network operators, central government, local government, private parties (vendors), communities in the 3T area, academics, and stakeholders, have their respective interrelated roles where these parties interact with each other, called the business ecosystem. Based on the description above, to address the challenges of the digital divide in the 3T region, more base transceiver station (BTS) construction is required. Therefore, there is a need for strategic efforts and appropriate business models regarding the development of comprehensive ICT infrastructure to increase digital accessibility for the community so that they can feel the benefits of information and communication technology, while also taking into account the risks from the operator's side. For this reason, the author conducted a research with the title " Optimization strategy for BTS development in the 3T region in responding to the challenges of the digital gap using a business ecosystem approach: Case study of Telkomsel Regional Sulawesi"

1.1. Problem Formulation

The provision of ICT access by operators is one of the programs listed in the Strategic Plan of the Ministry of Communication and Information for equitable distribution of broadband infrastructure. One of the things that will be the focus of the author is how to optimize the strategy in the construction of BTS in the 3T area to address the challenges of the digital divide in the region. The provision of Internet access in 3T areas to address the challenges of the digital divide in these areas can be achieved through mobile cellular services and broadband satellite Internet. To reduce the complexity of providing Internet access, the provision of Internet access through mobile cellular services is provided by Telkomsel operators in collaboration with various parties. Based on the background and problem formulation described above, the objectives of this study are as follows; It is possible to identify the actors involved and the role of each actor in the development of BTS in the 3T region. Able to know the relationship between actors that form the ecosystem of BTS development in the 3T region was visualized using ecosystem mapping. Identification of important factors in BTS development in the 3T region. Analyze the business ecosystem strategy used in the construction of the BTS in the 3T region. Able to reconfigure the ecosystem of BTS development in the 3T region. Recommendations are provided on optimization strategies for BTS development in the 3T region through an in-depth study of ecosystem mapping.

2. Literature Review

2.1. Business Ecosystem

The term "ecosystem" was originally used in the field of biological science to describe the interaction between living organisms and their environment. The ecosystem concept refers to the complex relationship between living things, physical environment, and other non-living factors in a certain area. However, with the development of science and technology, the ecosystem concept has been introduced in various studies in the fields of economics and business. In the context of economics and business, an ecosystem refers to a complex network of organizations, individuals, and other factors that interact with each other to create, market, and generate economic value.

Moore was the first to use it in an economic context. He argued that entrepreneurship does not exist in an empty space, hereby emphasizing the importance of the environment." Another important aspect of entrepreneurial ecosystems is the interconnectedness of actors (Motoyama, 2014); (Wahyuningsih & Kusumawati, 2015). The interaction between the firm and its environment implies the notion of co-development where co-development refers to "a two-way interaction in which both parties have an effect on each other's potential for success, which can lead to changes in several directions" as cited by (Syarif & Riza, 2022). From some of the above opinions, it is concluded that the Business Ecosystem is dependent on business actors, companies, and the business environment that interacts with each other, which provides opportunities for achieving their respective successes.

2.2. Business Ecosystem Modeling with Ecosystem Mapping

In a quote from Filiantari, Suharto, and Mazni (2021) the business ecosystem includes those who are generally considered part of a company: those within the walls of the organization plus distribution channels and direct suppliers. They also include extended enterprises such as direct customers, standards bodies, and suppliers of complementary products. Finally, they also include those who can have a significant influence on the core of the business, but are often dismissed or regarded as disruptive: trade associations, regulatory agencies, labor unions, investors, and so on.

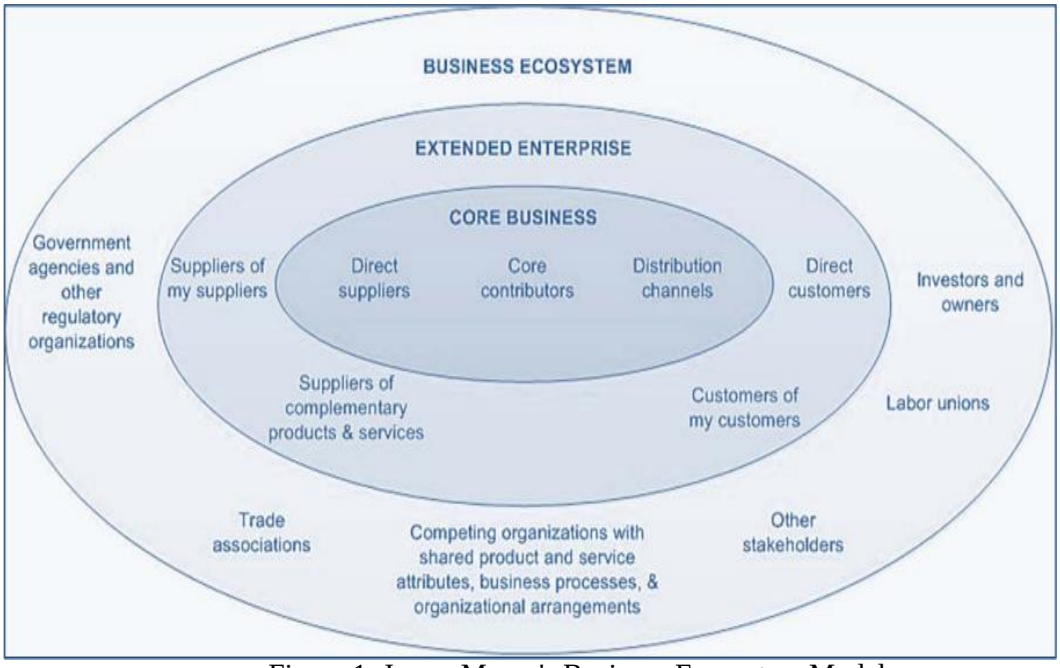

Figure 1. James Moore's Business Ecosystem Model

According to Ma, Christensen, and Jørgensen (2021) the framework and steps in modeling or mapping the business ecosystem are divided into three parts. As in Table 2.1 below:

Table 1. Stages of Business Ecosystem modelling

Part	Stages	Business Ecosystem Modeling
Part I	1	Identify the boundaries of the selected ecosystem.
Development of business	2	Identify actors and their roles in the ecosystem.
ecosystem architecture	3	Identify the value propositions and business models of the
	4	actors.
		Identify interactions between actors (different types of interactions)
Part II	1	Investigate influencing factors and their impact on elements
factor analysis		in the ecosystem (actors, roles and interactions)
		Investigate potential changes in the ecosystem
	2	
Part III	1	Multi-agent based ecosystem modeling to identify
Ecosystem simulation		ecosystem reactions to potential changes.
and reconfiguration		Ecosystem reconfiguration (including reconfiguration of
	2	actors, roles, and interactions) due to change, system dynamics modeling can be applied at this stage.
		Reconfigure the business model
	3	

Source: (Ma et al., 2021)

The relationship between actors can be determined based on the Value Network Analysis (VNA) model methodology from Allee, Schwabe, and Babb (2015) namely the existence of entities and transactions.

Entities are individuals, teams, groups, and companies. Meanwhile, transactions occur between two or more entities in an ecosystem that make exchanges in the form of purchases and sales by exchanging payments for goods, databases, security, agreements, criticism of suggestions, etc., which are the roles/obligations of each entity that can become the rights of other entities.

The two circles of unity symbolize entities in the business ecosystem. Meanwhile, transactions are depicted in two lines: the first line is a tangible transaction that can be seen, whereas the dotted line labels the intangible results given and received by the entity.

2.3. Ecosystem External Factor Analysis

According to Ward and Griffiths (1996) PESTEL analysis is a thorough examination of the external environmental factors of a business, covering political, economic, social, technological, environmental, and legal fields. PESTEL is used to assess the market of a business unit or organization. The PESTEL analysis provides a framework for assessing a company's situation, strategy, position, direction, marketing plan, or idea. This analysis allows the identification of new opportunities or threats, which are as follows.

Political Factors involving government policies, legal issues, and formal and informal rules in a company's operational environment. Economic factors include everything that affects customer purchasing power and business conditions such as economic growth, interest rates, exchange rates, inflation, and product and service prices. The current and future states of the economy can affect a company's progress and strategy.

Social factors consider the aspects that affect customer needs and market share. Social factors center on the assessment of consumer and employee attitudes that influence strategy. Strategic planners should keep abreast of changes in the level of education and social judgment to assess their impact on their strategies. However, the typical reaction of companies to social factors varies from changes in behavior to efforts to change social judgment and attitudes through public relations efforts.

Technological factors highlight the elements that support the efficiency of business processes and help companies face technological challenges. Government encouragement through tax policies and legislation also plays a role in this technological change. The willingness to innovate and take risks appears to be an important component. Furthermore, technological change requires a socioeconomic climate that can be accepted. Environmental factors include ecological and environmental aspects such as weather, climate, and climate change, which have a significant impact on various industries, especially tourism, agriculture, and insurance. Climate change caused by global warming encourages companies to take environmental responsibility with efforts to minimize damage. Governments are therefore responding by passing environmental laws, which in turn influence corporate strategies. Awareness of the potential impacts of climate change affects the products offered and the way companies operate, both in creating new markets and in reducing the impact on existing markets.

Legal factors related to the legal environment in which a company operates. Examples of new laws affecting company actions include the introduction of age discrimination, increased minimum wages, and stricter recycling requirements. Company law can impact company demand and costs, especially if it requires the development of new systems and procedures.

2.4. Business Ecosystem Development Strategy

According to Kamalaldin, Sjödin, Hullova, and Parida (2021) there are four ecosystem strategies in the face of digitalization: orchestra, dominator, complement, and protector. An ecosystem can be defined as "an adjusting structure of a multilateral group of partners that need to interact for the focal value proposition to be realized' (Adner & Kapoor, 2010). This definition is particularly relevant in the context of digitalization, as many ecosystem actors need to align activities to achieve a customer-oriented value proposition. Various conditions can influence ecosystem strategy configuration decisions, such as competition and cooperation opportunities and the role of suppliers in the ecosystem. The inability to configure the right ecosystem strategy for a given context may hinder the benefits of

digitization opportunities (Ebuka, Emmanuel, & Idigo, 2023). Figure 2. illustrates the core characteristics of the four strategies in matrix form, highlighting how each strategy is based on the supplier's role in the ecosystem (leader or follower) and the balance of cooperation and competition (cooperation or competition dominance).

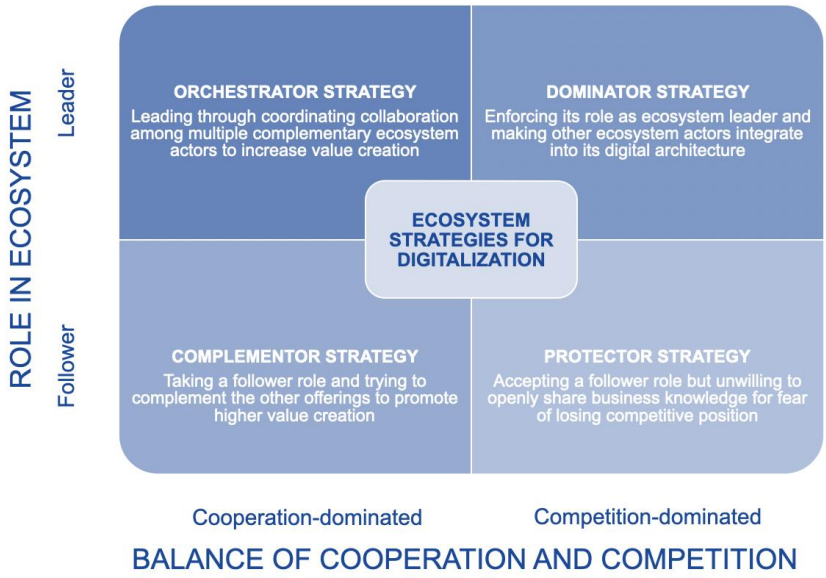

Figure 2. Strategy Matrix of 4 Characteristics in the Busines between Ecosystem
Source: 4 Ecosystem Strategies fozation: Insights from the Swedish Mining Industry (Kamalaldin et al., 2021)

2.5. Framework

Business ecosystems use ecological concepts and are developed by examining the relationships and interrelationships of each actor in an ecosystem. Ecosystems are formed by reciprocal relationships between living organisms and their environment. A biological ecosystem involves all organisms that interact with each other along with the environment and are in the same place. As described by Filiantari et al. (2021) the framework and steps in modeling or mapping a business ecosystem are divided into three parts, as shown in Table 2.

Table 2. Stages of Business Ecosystem Modeling

Part	Stages	Business Ecosystem Modeling
Part I Development of business ecosystem architecture	1	Identify the boundaries of the selected ecosystem.
	2	Identify actors and their roles in the ecosystem.
	3	Identify the value propositions and business models of the actors.
	4	Identify interactions between actors (different types of interactions)
Part II Factor analysis	1	Investigate influencing factors and their impact on elements in the ecosystem (actors, roles and interactions)
	2	Investigate potential changes in the ecosystem.
Part III Ecosystem simulation and reconfiguration	1	Multi-agent based ecosystem modeling to identify ecosystem reactions to potential changes.
	2	Ecosystem reconfiguration (including reconfiguration of actors, roles and interactions) due to change, system dynamics modeling can be applied at this stage.
	3	Reconfigure the business model.

Source: (Ma et al., 2021)

3. Methodology

3.1 Type of Research

According to Ferrari, Johnson, and McCown (1995) basically the research method is a scientific way to get data with specific purposes and uses. This research aims to optimize the BTS development strategy in the 3T area in Telkomsel Regional Sulawesi to obtain a win-win solution between each actor involved in it. This study used a business ecosystem approach with qualitative and descriptive methods. Quoting the concept of qualitative research from the book Qualitative Research by (Asmaradewi, 2019) this in-depth study focuses on small cases, including case studies. Through qualitative research, the goal is to obtain very detailed data from the case, as well as to achieve the goal of understanding how it happened. Therefore, the main purpose of qualitative research is that these facts can be understood and do not lead to spontaneous inferences (generalizations) or estimates (predictions) from the patterns found.

Through this type of research, it is hoped that literature speculation about observations that only produce value can be eliminated. The purpose of descriptive research is to explain and describe the existing social conditions in which a situation or event is observed. This research flow is similar to that of a journalist who directly targets the field to observe and interpret his writing so that readers can receive information in a cohesive manner. Qualitative research tends to be descriptive and analysis with an inductive approach that tends to be used based on the facts found, which will later be constructed into hypotheses or theories that support the research.

3.2 Operational Variables

In this study, the variables observed were Actors, Actor Roles and Relationships between actors, which are explained as follows.

1. Actors
   In the context of a business ecosystem, actors refer to entities that interact and contribute to the ecosystem. This includes companies, organizations, individuals, and groups that have roles and interests in the business ecosystem.
2. Role of actors
   The role of actors in a business ecosystem refers to the functions and contributions they make to carrying out economic activities. Each actor in the business ecosystem has a specific role that can vary, such as producers, distributors, suppliers, customers, authorities, and trade associations. Each role has certain responsibilities and objectives that contribute to the continuity and success of the business ecosystem as a whole.
3. Relationship between actors
   The relationships between actors in a business ecosystem include the interactions and dependencies between these actors. It involves the exchange of information, resources, products, and services, and the influence between them. The relationship between actors in a business ecosystem can be collaborative, competitive, or a combination of both, depending on the ecosystem's dynamics and goals.

The importance of the relationship between the actors in the business ecosystem is to achieve synergy, coordination, and mutual success. Collaboration and coordination between ecosystem actors can create value, innovation, efficiency, and new opportunities. In addition, dependence between actors in the business ecosystem can create stability and sustainability in economic activities.

3.3 Sampling Technique and Interviewee Criteria

According to Pervin and Begum (2022) sampling techniques are sampling techniques will be used in research, and various sampling techniques are used, namely probability sampling and non-probability sampling. The sampling techniques used in this qualitative study have been described by (Ferrari et al., 1995). Snowball sampling is a sampling technique for data sources that are initially small in number and gradually increase in size. This is because the small number of data sources cannot provide adequate data; therefore, so look for other people can be used as data sources. Thus, the number of sample data sources will increase, such as snowballs that continue to grow over time.

3.4 Data Analysis

To solve the problem and verify the problem formulation in this research, analytical techniques were used as a form of data flow obtained and processed. Analysis is very helpful in the process of systematically searching and organizing interviews, field notes, and transcripts needed to improve the researcher's understanding and findings in drawing conclusions from this research (Parela, Hudalil, Ariswandy, & Pradana, 2022).

4. Results and discussions

4.1. Identification of the Boundary of the Ecosystem

Based on the definition of a business ecosystem, it is important to define the region or community at the beginning of business ecosystem architecture design. Ecosystem boundaries need to be precisely described because the relevant stakeholders and their interactions may differ for different purposes (Ma et al., 2021). According to the explanation from the interview with Mr. Muhammad Idham Kadir as the General Manager of Network Operation Telkomsel Regional Sulawesi, the construction of BTS in the existing 3T area has a different scheme from the construction of BTS in the 3T area, which was previously said "previously 3T as called USO, yes USO BTS where the development of the device was by the operator. So, first it was transport, then the site infrastructure was by BAKTI, while the RAN equipment was from the operator, so that it would be easier for the operator to carry out operational management and then improve quality, now the operator may not be able to be too intense because there are already partners who execute.

This is reinforced by the explanation given by Mrs. Maryulis as an expert staff planning the development of BTS in the 3T region, namely, the initial 3T BTS development with a total of 1682 sites using a service lease scheme, while the current development of 7904 sites uses a self-asset scheme. The main difference between these two schemes is the provision of devices where in the service lease scheme BAKTI only provides advice in the form of towers, power and transmission devices, while for the asset lease scheme BAKTI provides everything from towers, power, transmission to active devices in the form of 4G BTS. Related to stakeholders who cooperate almost the same as between the service lease scheme and the asset lease scheme there are Kominfo, local government, BAKTI and OPSEL. For the asset lease scheme, the operator provides a compensation fee to BAKTI as a form of rental of the BTS infrastructure and equipment provided by BAKTI, as described in the table below:

Table 3. BTS Development Scheme in the 3T Region

OPERATION	USO 3T		USO BLANKSPOT	
	TSEL	BAKTI	TSEL	BAKTI
PROJECT PLANNING				
LOCATION		✓	✓	✓
RAN & INFRASTUCTURE		✓	✓	✓
CORE & BACKBONE	✓		✓	
ASET OWNERSHIP				
TOWER /POWER / ACCESS		✓		✓
RAN		✓	✓	
CORE & BACKBONE	✓		✓	
OPERATIONAL ACCOUNTABLE				
TOWER /POWER / ACCESS		✓		✓
RAN		✓	✓	
CORE & BACKBONE	✓		✓	
SALES & MARKETING	✓		✓	
Financial Scheme	Compensation Fee		No Fee Transaction	

Source: Company Internal

In Table 3, there are two schemes used in the construction of BTS in the 3T region: USO Blankspot, also known as the service lease scheme, and USO 3T, also known as the asset lease scheme. The difference can be observed in USO 3T, where the red check mark indicates a new scope of responsibility from the previous scheme. In the asset lease scheme, the determination of the location and construction of BTS infrastructure in the 3T area is the responsibility of BAKTI, where it was previously a joint responsibility between BAKTI and the operator. Then in terms of asset ownership in the form of Tower, Power and Access (Transmission) and RAN devices (BTS) are owned by BAKTI, in contrast to the scheme used previously where RAN devices became assets of the operator, so that in this asset lease scheme the operator only provides interconnection to the core and services. In terms of operations, all devices are handled by BAKTI through appointed partners. In the asset leasing scheme, there is also a compensation fee paid by the operator to BAKTI as a form of leasing infrastructure that has been used.

The discussion in this thesis concerns the construction of a USO 3T BTS carried out by BAKTI with an asset lease scheme. The advantages and disadvantages of this asset leasing scheme for operators are explained in Table 4.

Table 4. Advantages and disadvantages of asset schemes in the construction of BTS in the 3T region

Advantages	Disadvantages
1. The DRM process is faster because operators are only given the results of DRM by BAKTI after surveys and direct checks in the field by BAKTI partners. 2. Procurement of RAN devices (BTS) is done by BAKTI through partners so that operators do not require CAPEX expenditure for the purchase of BTS devices. 3. Maintenance and handling of BTS device disruptions are carried out by BAKTI partners so that operators do not require operational costs..	1. After implementing the project, there was a lot of overlap in coverage between 3T BTS and regular BTS, this was quite disruptive to regular services because the capacity of the incoming 3T BTS was smaller. 2. There is no clear agreement regarding additional service capacity because on the one hand the assets are not owned by the operator. so there is no full control over the process of increasing capacity and improving quality. If necessary, the capacity addition process cannot be carried out immediately. 3. The maintenance and trouble handling flow becomes longer, and operators do not have direct control over the equipment so they cannot go directly to the field to deal with faults directly. 4. There is a monthly compensation fee that the operator must pay to BAKTI as compensation for using the BTS infrastructure that has been provided.

4.2. Business Ecosystem Strategy Analysis

Various conditions can influence ecosystem strategy configuration decisions, such as opportunities for competition and cooperation as well as the role of suppliers in the ecosystem. The inability to configure the right ecosystem strategy for a particular context can hinder the benefits of digitalization opportunities (Prinhandaka, Rohman, & Wijaya, 2023). Figure 3 below depicts the core characteristics of the four strategies in matrix form, highlighting how each strategy is based on the supplier's role in the ecosystem (leader or follower) and the balance of cooperation and competition (cooperation dominance or competition dominance).

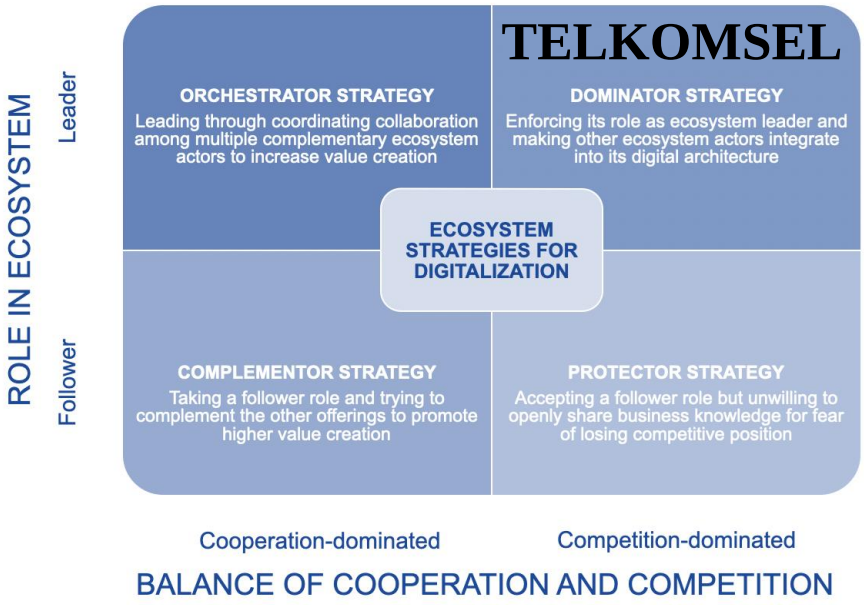

Figure 3: Strategy Matrix 4 Characteristics in the Business Ecosystem
Source: 4 Ecosystem Strategies for Digitalization: Insights from the Swedish Mining Industry (Kamalaldin et al., 2021) modified by the author

1. Orchestra Strategy

The orchestrator's strategy focuses on the leadership role through coordinated collaboration between various complementary ecosystem actors to enhance value creation. This strategy views the ecosystem as "more than the sum of its parts." The three main tactics used in this strategy are as follows:

a. Building an open digital architecture for shared value creation. Through this, other ecosystem players can connect their respective digital solutions, and orchestrators can coordinate their joint efforts to realize higher customer value.
b. Facilitate and incentivize exploratory collaboration between ecosystem actors to enable new value offerings. This can be achieved by providing open access to data and infrastructure for IoT application development.
c. Long-term cooperation should be coordinated between ecosystem actors with different capabilities to ensure successful commercialization. Naturally, new propositions have little or no value if commercialization is not achieved.

2. Domination Strategy

Another strategy is to choose to be a dominator, focusing on maintaining the role of an ecosystem leader and encouraging other ecosystem players to integrate into the digital architecture. The three main tactics used in this strategy are as follows:

a. Defining a closed digital architecture and pursuing selective value creation from a value offering. Thus, other ecosystem actors can participate selectively and only in measurable ways.
b. Take a central role in optimizing existing processes and directing other ecosystem actors to work exclusively with the dominator. This will likely be facilitated by existing relationships between industrial customers and dominators, who may already be active in digitalization efforts.
c. Encourage limited cooperation with other ecosystem actors and enforcement of regulatory standards. Other players have no choice but to adhere to these standards and integrate them into the digital dominator architecture if they want to share in the value proposition.

3. Complementary Strategy

Instead of taking the role of the leader, actors can become complements in the ecosystem, adopting the role of followers and seeking to complement other offerings to create higher value. This strategy is based on the following three main tactics:

a. Support unique technologies to build an open digital architecture approach for ecosystem leaders. For example, this can be achieved by providing technical and operational support, as well as by sharing data to meet customer needs.
b. Build close relationships with ecosystem leaders to increase value creation. The close relationships these complementors seek are formed by their offering of digital expertise that complements the leader's experience.
c. Partner with other ecosystem actors in a supportive way to combine resources with each other for a "bigger share." Complementarians recognize that value creation and utilization are strengthened when their capabilities and resources are combined with those of other actors.

5. Conclusions

Changes in government policies can affect the BTS development ecosystem, especially regarding programs that will be implemented in the 3T area. Changes in leadership in local governments can affect the relationship between the government and cellular operators, which can affect the fulfillment of internet access needs in these regions. In the reconfiguration of the BTS development ecosystem in the 3T area, there were no changes to the actors involved, but there were changes in the roles and interactions between actors. The choice of the dominator strategy has made Telkomsel take a more active role in developing the BTS in the 3T area. By becoming a dominator, Telkomsel achieves full control over the devices it owns, so that it can increase operational efficiency, handle disruptions, and improve service quality, which will have a positive impact on customers. There are four main actors who experience changes in roles and interactions: Telkomsel, BAKTI, PEMDA, and Fiberhome. To optimize BTS development in the 3T area, Telkomsel designed a roadmap that included three time stages: short-term, medium-term, and long-term. This strategy is based on the dominator strategy choice, which indicates Telkomsel's intention to lead and dominate in providing telecommunications services in the 3T area.

Limitations and Future Study

This study is limited by its focus on a specific set of actors within the 3T development ecosystem and may not capture the full complexity of other influencing stakeholders or regional variations. The dominance of Telkomsel may also present risks of over-reliance on a single provider, which could affect competition and innovation. Future research should explore the long-term sustainability of the dominator strategy, include perspectives from other operators or local communities, and assess how evolving government policies and leadership transitions impact the ecosystem over time.

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