

CHAPTER 1

INTRODUCTION

1.1 Background

In this digital era, the use of the internet with fixed broadband and cellular networks is needed to improve the quality and performance of a technology. The increasing need for network-connected devices such as smartphones, tablets, and other smart devices goes hand in hand with the increasing need for supporting technologies such as Machine-to-Machine (M2M) communication, Internet-of-Things (IoT) technology, Virtual or Augmented Reality (VR)/(AR), industrial automation, smart cities, and autonomous vehicles [1]. The development of increasingly sophisticated technology must be supported by capable fixed broadband and cellular networks. The fifth cellular network technology, or 5G, is one of the technologies considered to give great performances because of its ability to provide specific content. The development of 5G technology is capable of providing qualified connectivity to support services in vertical industries, with high data rate capabilities, low latency of 1 ms with packet error rates of 10^{-5} and has a high level of reliability [2].

The development of 5G technology is carried out to improve broadband services and focus on special services and locations. In its development, 5G changed by implementing it in indoor rooms and using small cells [3]. Using the network in small indoor cells makes the services provided more specific and requires particular infrastructure that can supports it, thus making it difficult for Mobile Network Operators (MNO) to develop and build specific and different infrastructure in each location. The difficulty faced by MNOs to develop 5G using a high-frequency spectrum is that MNOs need to build small cell infrastructure, and the required coverage area will be limited, so they need to incur higher costs and investments. In overcoming this problem, an indoor scale operator or micro operator can be a solution to provide indoor

network services. Micro operators focus on developing local small cell networks that provide network services according to user needs and collaborate with network infrastructure vendors, facility owners and users, utilities service companies, regulators, device and equipment vendors, content providers and MNOs [4].

In the development of micro operators, spectrum rental is one of the obstacles because there are no regulations governing spectrum rental schemes for micro operators. The limited number of spectrum license providers, expensive and long rental fees and times, and wide coverage on a national scale make network development difficult [4]. The management of the frequency spectrum regulated by the government can significantly contribute to Non-Tax State Revenue (PNBP) of Rp20.9 trillion, comes from cost of Frequency of Use-Right Fee (BHP) with an average achievement rate of 117.55% during the 2016-2020 period [5].

Table 1. 1 PNBP from BHP Frequency

No.	Year	Target	Realization	Level
1	2016	12.970.390.955	13.699.394.770	105.62%
2	2017	12.951.884.208	16.559.804.470	127.86%
3	2018	14.634.476.271	16.568.287.569	113.21%
4	2019	14.786.883.682	17.605.970.108	119.06%
5	2020	16.972.963.646	20.706.918.508	122.00%

Frequency spectrum rentals are generally carried out under the primary market or auction and the secondary market or spectrum sharing. The auction process is the most common way to get a spectrum use permit. The auction process can determine the winner with a good business plan and the highest price offer so that this will also affect the country's Gross National Product (GNP) to support decent money public financing. [6]. In addition, in terms of frequency spectrum rental, there is a new scheme, namely spectrum sharing, where more than one operator can use one frequency bandwidth by

leasing to an operator who has a license from the auction proceeds. This scheme has begun to be implemented in several countries for example, the United States and the European Union, which allow spectrum sharing schemes with their respective provisions and policies. In Indonesia, spectrum sharing began to be inaugurated with the issuance of Law Number 11 of 2020 or the Job Creation Law which was carried out to accelerate technological progress while still overcoming the use of limited frequency spectrum.

The use of spectrum for micro operators can be done in two schemes, as shown in Figure 1.1, namely by (a) leasing spectrum from MNO or spectrum sharing and (b) leasing spectrum directly from regulators [7]. Spectrum leasing schemes for micro operators must be able to support existing businesses owned by stakeholders.

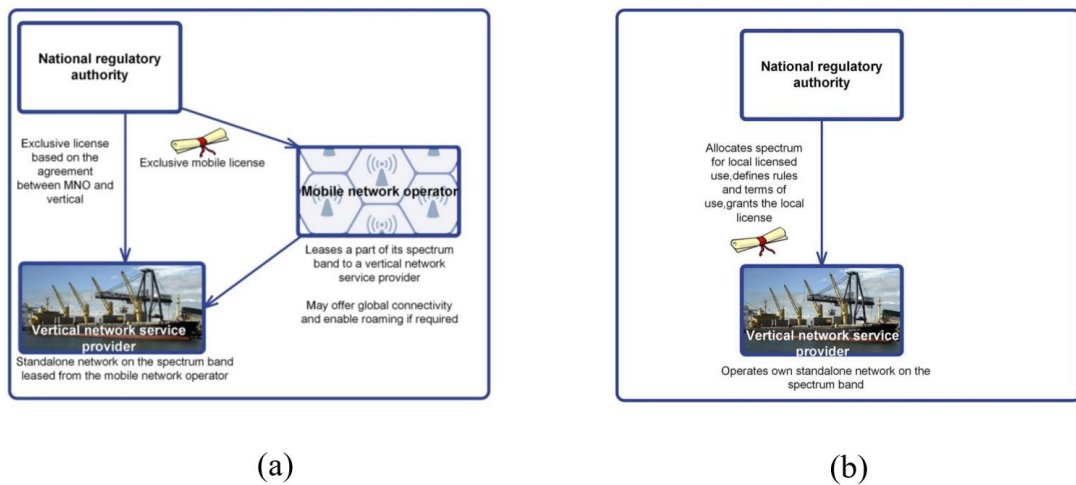


Figure 1. 1 Spectrum Rental Scheme for Micro Operators

In a previous study [8], the calculation of spectrum prices was carried out for the Nigerian region by taking into account Administered Incentive Pricing (AIP), Cost Opportunity Pricing (COP), and maximizing the country's economic benefits with the proposed frequency price. The final result of this research is the proposed price of Frequency Utilized Pricing (FUP), and it is proven that there is an increase in income from the existing FUP.

In another study [9], the calculation of the price of spectrum profits on the secondary market used four scenarios, with the first scenario being that the license transfer is not allowed by the regulator, the second scenario is that it is allowed to transfer licenses but not reconfiguration is allowed, the third scenario is that license transfers are allowed and can be reconfigured, but the use of the transferred frequencies must use the same technology, and scenario four is the same as scenario three but more flexible because it is allowed to be used on different technologies and services. From this research, the enormous profit occurred in scenario four with a benefit of IDR 236.1 billion over ten years and a discount rate of 7%.

In this study, the analysis of the frequency spectrum rental business model for micro operators that can optimize the use of 5G technology with specific services and locations. The research is determined using business management analysis with the V⁴ business model, techno-economic analysis with capacity planning calculations and CAPEX & OPEX calculations, and regulatory analysis to obtain regulatory recommendations for developing micro operators in Indonesia.

1.2 Research Problems

The focus of the problem in this study is to provide recommendations for frequency spectrum rental schemes for micro operators. The research problem in this study are:

1. How is Micro Operator implemented in Indonesia?
2. Can Micro Operator feasible to be applied in Indonesia?
3. What are the existing regulations in Indonesia regarding the implementation of Micro Operator in Indonesia?

1.3 Research Objectives

This study aims to comparing two scenarios of spectrum rentals business models of micro operators (Direct allocation from government and Spectrum sharing) and provide business model recommendations to be use in Indonesia.

1.4 Scope of Works

In this study, there are several limitations of the problem, namely.

1. Development of micro operators using two scenarios; spectrum allocation from government and spectrum sharing
2. This study analyzes the business model using the V⁴ business model
3. Using micro operators as telecommunications network operators
4. The economic studies carried out in this study use the calculation of capacity planning and CAPEX & OPEX costs
5. The industrial area used is Karawang International Industrial City

1.5 Research Methodology

This research has a workflow in several stages, namely as shown in Figure 1.2:

1. Collecting data

Data collection on population and area was obtained from the official website of Karawang International Industrial City (KIIC).

2. Business Management Analysis

At this stage, a mapping of business management values related to micro operators is carried out for later analysis using the V⁴ business model.

3. Techno-Economic Analysis

At this stage, capacity planning calculations and CAPEX & OPEX calculations are carried out, including Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period.

4. Regulation Analysis

At this stage, regulatory analysis is carried out using normative juridical methods based on existing regulations and data from previous analysis, then mapped to five points, namely targets to achieve, resource to manage, right to protect, sovereignty to preserve, and sustainability to maintain.

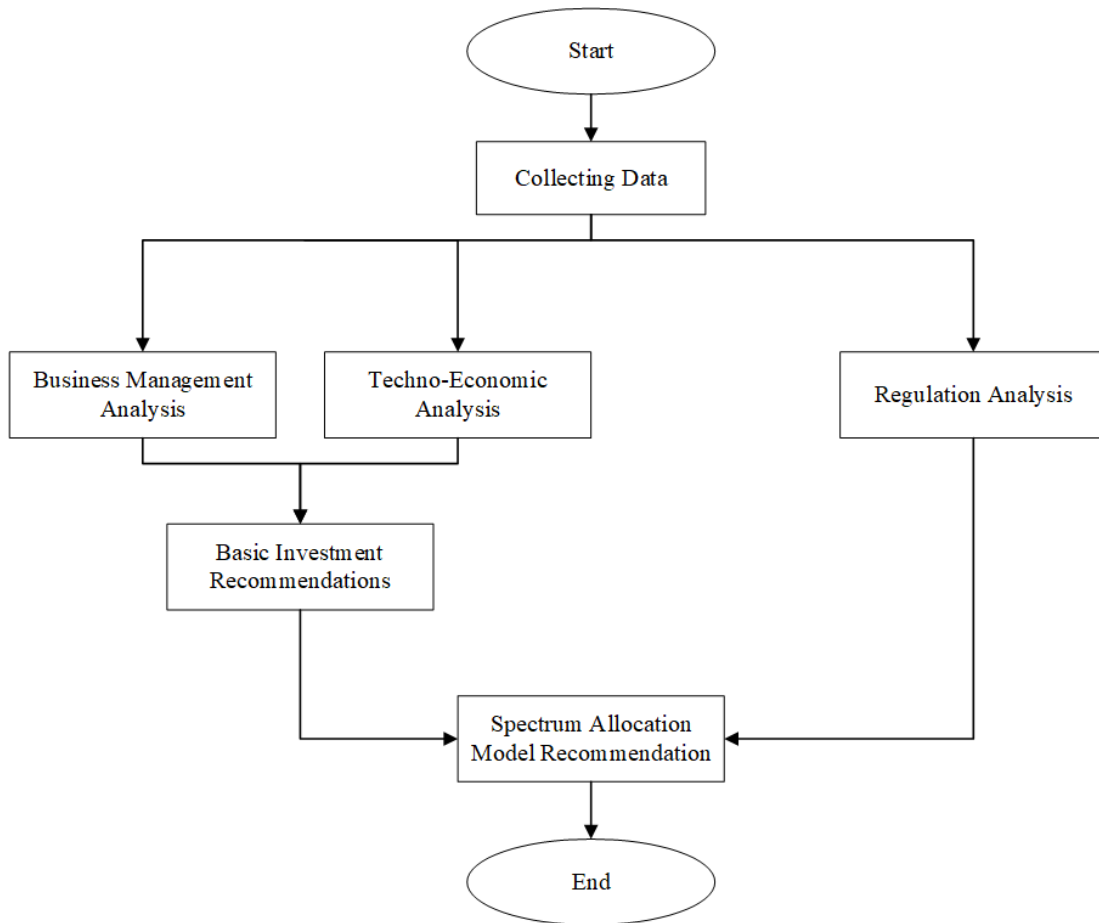


Figure 1. 2 Research Flowchart

1.6 Writing System

The systematics of writing this thesis is structured as follows:

1. CHAPTER 1 INTRODUCTION

This chapter contains the background, research problem, research objective, scope of works, research methodology, and writing systematics.

2. **CHAPTER 2 LITERATURE REVIEW**

This chapter contains supporting theories related to the final project being carried out.

3. **CHAPTER 3 RESEARCH PLANNING**

This chapter contains research planning, techno-economic parameters, and business parameters

4. **CHAPTER 4 RESULT AND ANALYSIS**

This chapter contains techno-economic calculation and regulation analysis results

5. **CHAPTER 5 CONCLUSION AND SUGGESTION**

This chapter contains conclusions from the research and suggestions for future developers.