

# CHAPTER I

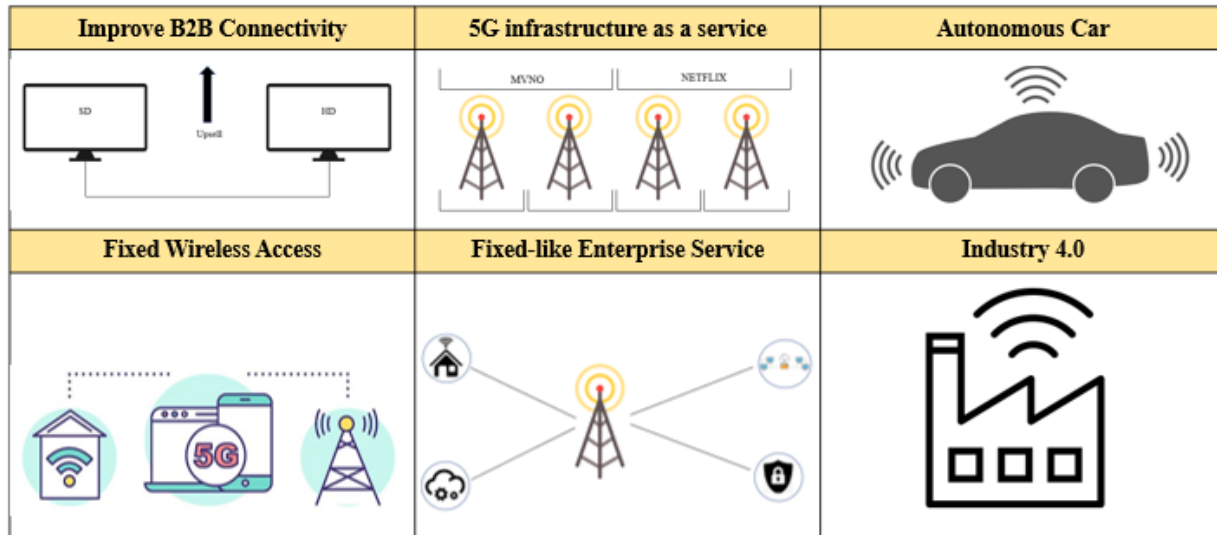
## INTRODUCTION

### 1.1 Background

Telecommunications networks technology is growing day by day, starting from 1G, 2G, 3G, 4G, and currently, Indonesia is intensively developing 5G networks. The 1G network was first implemented in Indonesia in 1984 using a frequency of 470 MHz. The services provided by this 1G network are only voice services. Ten years later, in 1994, 2G networks started to be implemented in Indonesia. On the 2G network, the quality of voice services has increased compared to 1G network. In addition, the 2G network has been able to use the Short Message Service (SMS) service. In 2005, the 3G network began to implement in Indonesia. Three operators, Telkomsel, Indosat, and Excelcomindo, use 3G frequencies at 1900 MHz. The services provided by the 3G network are video calls, streaming, and the internet. After the 3G network, the 4G network was emerged, which is currently still used in Indonesia, and now Indonesia is currently developing 5G networks. There are several challenges in preparing a 5G network, which causes the launch of the 5G network delayed in Indonesia. The 5G network delivers better services than the previous generation. The services provided by the 5G network include voice, data, video calls, online gaming, HD TV, or video streaming services [1], [2].

5G network requires frequency spectrum in three different bands: low band, mid-band, and high band. Frequency below 1 GHz was categorized as low band frequency. The low band can support network coverage in urban, suburban, and rural areas. The capacity of this low band frequency needs to be increased to get connectivity equality between urban and rural areas. The mid-band frequency is in the 3.3 GHz to 3.8 GHz band. However, the 1500 MHz, 1800 MHz, 2.1 GHz, 2.3 GHz, and 2.6 GHz frequency bands can still be used as the mid-band frequency on the 5G network. The high band on the 5G network is in the 26 GHz to 71 GHz. The minimum bandwidth used in the 5G network is 80 MHz to 100 MHz, five times more than the 4G network, requiring a minimum bandwidth of 20 MHz. 5G networks will require a more frequency spectrum to maintain Quality of Service (QoS) and meet growing demand as the population grows in the long term [3], [4].

Currently, 5G is the focus in the Mobile Network Operator (MNO) business because 5G can provide various new services for consumers and industry through the network. The 5G network can open new segments in the industry for MNOs and Mobile Virtual Network Operators (MVNO) to provide the new services that may not have been available in previous generations. In 5G development, MVNO can focus on service development, so MVNO will have market opportunities in 5G technology Figure 1 shows the services adopted on a 5G network [1].



**Figure 1.** 5G Network services[1].

The potential services provided by the 5G network can support the acceleration of digital transformation carried out by the Government. So, this study proposes a study on the implementation of MVNO on 5G networks in Indonesia. MVNO is a wireless communication service provider that does not have a frequency spectrum license, so MVNO must lease a frequency band from MNO to provide services to its customers [6].

The previous research is about Cost-Benefit Analysis of the implementation of MVNO on the 4G LTE network in Bandung City. This research uses capacity planning as a technical calculation. The study results stated that the appropriate business model to be applied in Bandung is a brand reseller with an NPV of 2 billion and an IRR of 53.8% [6]. In addition, there is research on Techno-Economic Analysis in big cities in Indonesia. This research calculates capacity and coverage planning on 5G networks carried out in DKI Jakarta, Medan, and Surabaya and calculated Capex and Opex based on gNodeB needs in those areas [7]. Therefore, this study will analyze the implementation of MVNO in Indonesia on the 5G network by

analyzing technical requirements, applicable regulations, and the economic feasibility of the MVNO. The frequency that will be analyzed in this study is the frequency of 2300 MHz. The economic feasibility analysis will calculate the Capex, Opex, NPV and IRR, PBP, ROI methods, and sensitivity analysis. From a regulatory perspective, it will analyze Undang-Undang No. 11 Tahun 2021.

## **1.2 Objective Research**

This study analyzes the feasibility of implementing MVNO in Indonesia on a 5G network. The analysis divides into three parts: technical analysis, economic analysis, and regulatory analysis. The calculation of 5G capacity planning divides according to the segmentation determined in the technical analysis. In the economic analysis, economic feasibility will calculate Capex, Opex, IRR, NPV, PBP, ROI, sensitivity analysis, and MNO revenue growth for the implementation of 5G MVNO in Indonesia. The regulatory analysis will review existing regulations if Indonesia wants to implement MVNO. The implementation of MVNO will help the government immediately implement 5G in Indonesia and accelerate digital transformation. The results of this research can be an insight for the government and regulators in implementing 5G networks in Indonesia.

## **1.3 Problem Identification**

This research focuses on calculations and analysis related to the implementation of MVNO for 5G networks in Indonesia. The scope identification in this study:

1. How is the implementation of MVNO on 5G Networks in DKI Jakarta?
2. Is MVNO feasible to be applied to 5G Networks in DKI Jakarta?
3. Is the existing regulation can support the implementation of MVNO in Indonesia?

## **1.4 Scope of Problem**

The limitations of the problem in this study are as follows:

1. This study will analyze the implementation of MVNO on a 5G network with a case study of the DKI Jakarta area.
2. The technical analysis is about the calculation of Capacity Planning on the 5G network, and the equipment needed for MVNO based on the existing business model.
3. The frequency to be analyzed is 2300 MHz following the 5G frequency used for commercialization by operators in Indonesia.

4. The economic analysis is carried out based on the calculation of Capex, Opex, IRR, NPV, ROI and calculating the return on investment or PBP, sensitivity analysis and the amount of revenue obtained by MNO.
5. Regulatory analysis refers to Undang-Undang No. 11 Tahun 2021 tentang Cipta Kerja and Undang-Undang No. 36 Tahun 1999 tentang Telekomunikasi.

## **1.5 Methodology**

This research has a workflow that is carried out in several stages as illustrated in Figure 2. The stages are as follows:

### **1. Literature Study**

At this stage, a search for information related to the research topic will be carried out. Literature studies can be sourced from books, journals or papers, results of previous research, and other sources.

### **2. Data Retrieval**

In this study, population data will be collected through the Central Statistics Agency (BPS), the cost of 5G infrastructure development by MNO through the annual financial report.

### **3. Techno Economic Calculation**

At this stage, calculations will be carried out from a technical and economic perspective. For calculations from the technical side, capacity planning will be calculated to determine infrastructure needs and MVNO user predictions. Economic calculations carried out are calculating Capex, Opex, PBP, IRR, NPV, sensitivity analysis and revenue growth from the MNO side.

### **4. Anaysis**

In this research, analysis will be carried out from the technical, economic, and regulatory aspects. At this stage, analyzing the results of techno-economic calculations and regulatory analysis will be carried out based on a review of Undang-Undang No. 11 tahun 2021 tentang Cipta Kerja and Undang-Undang No. 36 Tahun 1999.

### **5. Conclusion**

At this stage, conclusions will be drawn based on the research that has been done and then provide research recommendations.

## 1.6 Research Method

The techno-economic method aims to find costs to determine the product's economic feasibility and competitive level based on a technical calculation to realize this design. If it is not economically feasible, the technical design must be revised again. However, the technical design can be implemented if the economic analysis is feasible. The techno-economic method is closely related to science-oriented towards disclosing and calculating the economic value in a technical activity plan.[2].

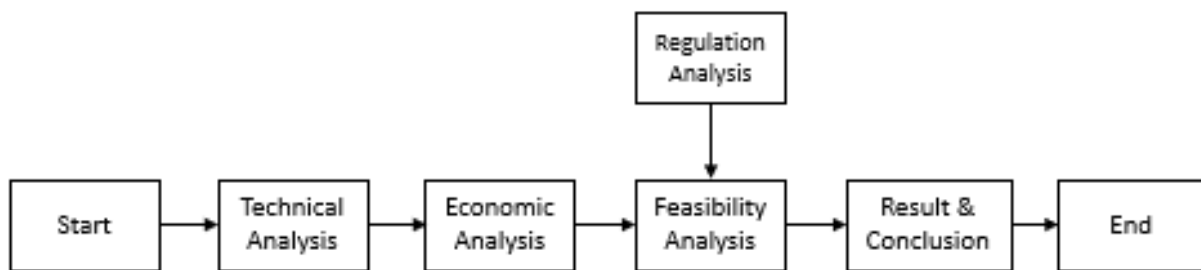


Figure 2. Research diagram.

## 1.7 Hipotesis

Based on the results of previous research regarding the implementation of MVNO on the 4G LTE network in Bandung, it shows that the implementation of MVNO is feasible to be applied in the City of Bandung on the Brand Reseller business model [6]. So based on the reference, by researching the implementation of MVNO on the 5G network in DKI Jakarta and analysis from a technical, economic, and regulatory perspective, it will show the feasibility of implementing MVNO in DKI Jakarta and be able to find out the advantages and disadvantages of implementing MVNO.