

Frequency Migration Challenges and Strategic Decisions-Making in Broadband Wireless Access Networks

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Abstract

Purpose: The impetus for this study lies in the pressing need for telecommunication companies to adapt to the rapidly evolving technological landscape and regulatory environment to maintain competitiveness and meet increasing consumer demands.

Method: This study conducted a comprehensive analysis using SWOT analysis, Qualitative Data Analysis, and the Analytical Hierarchy Process (AHP) to determine the best course of action.

Results: This study navigates through the initial stages of identifying the strategic, operational, and financial implications of PT. XYZ Frequency Migration. It delves into the background of Broadband Wireless Access (BWA) technology, the significance of the 3.3 GHz and 10 GHz bands in telecommunications, and the broader context of industry trends necessitating this shift.

Conclusions: The migration of PT. XYZ from the 3.3 GHz to the 10 GHz band represents a strategic move to enhance broadband capacity, service quality, and market competitiveness. Through a holistic evaluation using SWOT, stakeholder input, qualitative data, and the Analytical Hierarchy Process (AHP), the initiative is shown to be both viable and forward-looking despite its complexity. Success hinges on PT. XYZ's ability to synchronize technological upgrades with regulatory compliance, financial prudence, and stakeholder engagement.

Limitations: This study is limited by its reliance on qualitative assessments and structured decision-making tools that may not fully capture dynamic market or regulatory shifts. Additionally, the scope did not include real-time performance data post-migration, which could further validate the strategic assumptions.

Contributions: This study contributes to the academic and practical understanding of network migration within the telecommunications sector, offering nuanced insights into the complexities of transitioning to higher frequency bands.

Keywords: *Analytical Hierarchy Process, Network Migration, Regulatory Compliance, Spectrum Frequency Transition, Telecommunications Technology*

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1. Introduction

In the current digital age, Internet speed has emerged as a critical factor in a country's development. This significance is attributed to the vital role of the internet in various aspects of life (Aulia, Rizki, Prindiyana, & Surgana, 2023); (Habibillah & Hadjri, 2023). The current Internet speed in Indonesia remains subpar compared with other countries in Southeast Asia. According to Speedtest Global Index data as of March 2024, Indonesia ranks 101st out of 142 countries in terms of mobile Internet speed, with an average velocity of 25.45 Mbps.

The Indonesian government has implemented various strategies to improve the nation's internet connectivity. One of these initiatives is the launch of 5G networks in Indonesia. As the latest generation of Internet technology, 5G offers significantly higher speeds than 4G and is expected to drive economic growth and enhance the populace's quality of life. To facilitate the deployment of 5G technology, the government has undertaken a reorganization of the frequency allocations. This measure aims to optimize the efficiency of spectrum utilization and improve the quality of Internet services. Such reorganization is projected to lead to an increase in Internet speed while addressing issues related to interference and degradation of the signal quality.

In alignment with the program, the Minister of Communication and Information Technology released Decision No. 688 of 2020, which mandates the discontinuation of radio frequency spectrum usage within the 3312.5 MHz to 3400 MHz band and grants priority for transitioning to the 10 GHz frequency band. PT. XYZ was accorded two years, extending until 2022, to complete this migration. The government has instructed operators active within this frequency range to move to the 10 GHz frequency without offering any form of compensation. On January 18, 2021, PT. XYZ submitted a proposal letter seeking specific discretion to continue serving clients whose contracts were concluded by 2024. For the transition to the 10 GHz frequency, PT. XYZ devised a phased implementation strategy to ensure a seamless migration.

However, technological advancement and regulatory imperatives are propelling a shift from the traditionally utilized 3.3 GHz band to the 10 GHz band. This migration is not merely a technological modification; it has far-reaching implications for the operational, strategic, and market dynamics of BWA operators such as PT. XYZ. While the shift to the 10 GHz band opens doors to enhanced service delivery and potential economic advantages, it simultaneously ushers in a new set of challenges - technical, infrastructural, and regulatory. In the context of PT. XYZ's frequency migration from 3.3 GHz to 10 GHz navigates a transformative phase that is critical for sustaining its competitive edge in the Indonesian telecommunications market. The transition to a higher frequency band is driven by regulatory mandates and the strategic necessity to improve service quality and network capacity.

PT. XYZ's migration from 3.3 GHz to 10 GHz is a multifaceted initiative influenced by regulatory requirements, technological advancements, and strategic business considerations. Successfully navigating this transition requires a holistic approach that addresses operational, financial, and market-related challenges to capitalize on the opportunities presented by the new frequency band. This will enable PT. XYZ to strengthen its market position, enhance service quality, and meet customers' evolving needs in the digital age.

The primary purpose of this research is to understand the business implications of migrating from the 3.3 GHz band to the 10 GHz band for Broadband Wireless Access (BWA) services, specifically in the context of PT. XYZ. This study seeks to apply frameworks such as SWOT Analysis, the Stakeholder Analysis, Qualitative Data Analysis and the Analytic Hierarchy Process to assist in decision-making during this complex migration process.

This study aimed to comprehensively assess and address the multifaceted challenges of PT. XYZ encounters the migration of its BWA services from the 3.3 GHz to the 10 GHz band. Investigating the technical challenges inherent in frequency transitions and identifying strategies for PT. XYZ to overcome these hurdles, while ensuring operational continuity. Examining the strategic impacts of migration on PT. XYZ's market positioning, competitive dynamics, and customer relations to understand broader business consequences. Assessing the regulatory landscape and determining PT. XYZ can effectively navigate the legal and compliance requirements associated with a frequency shift. We analyze the financial aspects of the migration process to ascertain PT. XYZ can maintain financial stability through this transition. Employing an Analytic Hierarchy Process to develop a decision-making framework that aids PT. XYZ navigates the complexities of migration and makes informed, strategic decisions. Offering insights and actionable recommendations to aid PT. XYZ and similar entities in effectively managing their BWA service migrations, thereby contributing to the wider discourse on strategic decision-making in telecommunications network evolution.

2. Literature Review

2.1 Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis

Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is a widely used strategic planning tool that provides a structured approach to assessing an organization's internal and external environments (Kumar & Praveena, 2023); (Mashuri & Nurjannah, 2020). It has been broadly recognized in academic literature as a fundamental tool for strategic management and planning (Bernroider, 2002).

SWOT analysis can be traced back to the work of Humphrey at the Stanford Research Institute in the 1960s and 70s. The objective was to create a simple, practical tool that managers could use to analyze their organization's strategic position and formulate plans for the future. Over the decades, SWOT analysis has been refined and its application has extended across various domains, from business strategy and marketing to human resources and project management.

SWOT analysis involves examining four key aspects of an organization: strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are internal factors that the organization has control over, whereas opportunities and threats are external factors that are typically beyond the organization's control (Tambaani, Mandey, & Mandagie, 2024); (Wahyuningtias & Chung, 2022).

Table 1. SWOT Matrix

	Internal Strength (S)	Internal Weakness (W)
External Opportunities (O)	SO: "Maxi Maxi" Strategy: Strategies that use strength to maximize opportunity	WO: "Mini Maxi" Strategy: Strategies that minimize weakness by taking advantage of opportunities
External Threat (T)	ST: "Maxi Mini" Strategy: Strategies that use strength to minimize threat	WT: "Mini Mini" Strategy: Strategies that minimize weakness and avoid threat

Source: Person data (2023)

Strengths are the resources and capabilities that give an organization an advantage over its competitors. This could include strong brand recognition, dedicated workforce, unique technology or patents, or robust financial resources (Irawan, 2024); (Zainuri & Setiadi, 2023). Weaknesses are internal limitations or deficiencies that put the organization at a disadvantage compared to competitors. These include outdated technology, high employee turnover, limited financial resources, or weak brand recognition (Lim, 2020); (Putra, 2017).

Opportunities are external factors that an organization can exploit to exploit its advantages. These include market trends, changes in customer preferences, regulatory changes, and technological advancement (Fahmi, Kostini, Barqin, & Juliandri, 2023); (Paroli, Sugiat, & Rusdian, 2023). Threats are external factors that can harm an organization. These include competition, economic downturns, regulatory changes and negative market trends (Azhari, 2024); (Ulinnuha, Fatmawati, & Marlyana, 2023).

SWOT analysis is valued for its simplicity and flexibility. It can be used by organizations of all sizes and across various industries (Yatminiwati & Ermawati, 2021). Moreover, it can be applied to a wide range of scenarios, from formulating a corporate strategy to planning a new project or evaluating a potential merger.

Although the simplicity of the SWOT analysis is a strength, it can also be a limitation if the analysis is

not conducted thoroughly and systematically (Popescu & Scarlat, 2015). For example, merely listing strengths, weaknesses, opportunities, and threats without prioritizing them or considering how they interact with each other can lead to superficial understanding and weak strategic decisions (Relina, Rasya, & Falayati, 2021). Therefore, it is crucial to conduct SWOT analysis in a thoughtful and rigorous manner.

In the context of PT. XYZ's decision to migrate its BWA services from the 3.3 GHz band to the 10 GHz band, a SWOT analysis, could provide valuable insights into the internal and external factors that may affect this decision. By clearly identifying and analyzing these factors, PT. XYZ can make informed decisions and develop an effective migration strategy.

2.2 Qualitative Data Analysis

Qualitative Data Analysis (QDA) is a methodological sector within social sciences that focuses on the interpretative analysis of various forms of data, such as interviews, observations, and texts (Rijali, 2018). Its main objective is to discern patterns, themes, and meanings within the data, providing a complex and nuanced understanding of the research context, unlike quantitative analysis, which seeks to quantify data and apply statistical models.

The origin of Qualitative Data Analysis (QDA) can be traced back to the evolution of qualitative research methods within the social sciences to explore and understand the complexities of human behavior and social phenomena. Unlike quantitative analysis, which focuses on numerical data and statistical methods, QDA seeks to interpret non-numeric data, such as interviews, observations, and textual material, to uncover patterns, themes, and meanings.

2.3 Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) is a structured technique for organizing and analyzing complex decisions based on mathematics and psychology (Astuti, Sari, & Azizah, 2020). It was developed by Thomas L. Saaty in the 1970s and has been extensively used in fields such as government, business, industry, healthcare, and education.

Thomas L. Saaty, a professor at the University of Pittsburgh, first introduced the Analytic Hierarchy Process in the 1970s as a decision-making framework to handle complex, multi-criteria problems. It was designed to provide a comprehensive and rational methodology for structuring a decision problem, representing and quantifying its elements, relating these elements to overall goals, and evaluating alternative solutions (Saaty, 1980) in (Cooper, 2017).

Over time, AHP has been refined and extended, and it is now used worldwide in a wide variety of decision situations, from product selection to corporate planning, resource allocation, and conflict resolution (Fountzoula & Aravossis, 2021). AHP uses a multilevel hierarchical structure of objectives, criteria, subcriteria, and alternatives. Pertinent data are derived through pairwise comparisons of criteria (or alternatives) with respect to their parent node in the hierarchy. Priorities are derived for each node, and a numerical priority or weight is computed for each decision alternative, which can be used to rank the alternatives for decision-making (Nababan & Sinambela, 2024).

The resulting weights or priorities for each alternative would provide a quantitative basis for determining the best overall strategy for migration. However, it is important to note that while AHP provides a rigorous and transparent framework for decision-making, it still involves subjective judgements, and the quality of the results depends on the accuracy and consistency of these judgements (Tavana, Soltanifar, & Santos-Arteaga, 2023).

2.4 Marginal Theoretical Contribution

While Broadband Wireless Access (BWA) frequency migration holds considerable importance in today's digitally focused market, especially within dynamic economies such as Indonesia, there is a notable lack of academic investigation in this area. Previous research has largely focused on the

technical dimensions of BWA, leaving a considerable void regarding the implications of such migration at the practical, strategic, and operational levels.

This study seeks to address this gap by conducting a comprehensive PT analysis. XYZ's transition from a 3.3 GHz to a 10 GHz frequency band. This research will dissect the catalysts behind the decision to migrate frequencies, scrutinize the complex challenges this transition presents, and evaluate strategies adopted to overcome these challenges. Moreover, this study assesses how this frequency shift impacts PT. XYZ's market presence, competitive edge, and service delivery quality.

This study contributes to marginal theoretical advancement in the field of technology strategy within the telecommunications sector by conducting a novel investigation of PT. XYZ's strategic frequency migration from 3.3 GHz to 10 GHz. It builds on previous studies in this domain, as reflected in the comparison table below, which synthesizes various research efforts to underscore the incremental progression of knowledge.

The comparative analysis includes case studies ranging from 2013 to 2021, employing methods such as the Analytic Hierarchy Process (AHP), SWOT Analysis, and topic modeling, with a common focus on technological adoption and strategic decision-making. Each study had distinct objectives, from evaluating key factors for mobile service adoption to suggesting development strategies for the Korean satellite and space industry. Table 2.3 reveals that decision-making impacts spanned technology assessment, market strategy formulation, and strategic management implications, all of which are instrumental to organizational competitiveness.

Moreover, software tools have been consistently utilized to enhance analytical precision by employing NVivo and SpiceLogic, reflecting the increasing complexity and rigor of contemporary research methodologies. The object of this study is pivoted from mobile services and NFC technology to satellite and space industry analysis and now to frequency migration in broadband wireless networks.

The findings across the table indicate a trajectory towards more strategic and complex investigations, with earlier studies emphasizing functionality and consumer preferences, while recent research, including this study, focuses on strategic pathways for navigating technological shifts. The research contexts ranged from Europe to Italy, South Korea, and now to Indonesia, which highlights the geographical broadening of the research foci.

3. Methodology

3.1 Research Design

Meticulously crafted research design is paramount, serving as an intellectual scaffolding for a comprehensive investigation of the strategic migration of PT. XYZ from the 3.3 GHz to the 10 GHz spectrum. This design is instrumental in navigating the multifaceted dimensions of frequency migration, integrating an array of methodologies ranging from an initial exploration of the migration context through in-depth literature reviews to rigorous qualitative and quantitative analyses, including SWOT and Analytic Hierarchy Process (AHP) evaluations.

Each stage is purposefully chosen to dissect the complexities of migration, ensuring a holistic understanding of technological shifts, regulatory landscapes, and market dynamics. By defining clear objectives, gathering rich data from diverse sources, and applying strategic analytical tools, the research design anchors the study in robust academic rigor while providing actionable insights for PT. XYZ navigation through spectrum transitions.

This structured approach not only enhances the thesis's academic contribution but also offers a strategic blueprint for PT. XYZ, emphasizing the indispensable role of a well-thought-out research design in addressing real-world business challenges within the telecommunications sector (Creswell & Creswell, 2017).

3.2 Data Collection Methods

Semi-structured interviews were chosen as the primary data collection method, owing to their flexibility and adaptability. They allow for in-depth exploration of participants' experiences and perspectives, providing rich, detailed data that can offer valuable insights into the migration process (Ruslin, Mashuri, Rasak, Alhabsyi, & Syam, 2022). The interviews were guided by a set of predetermined questions, but the interviewer was free to probe further and ask follow-up questions based on participants' responses.

The interviews were conducted either in person or via video conferencing depending on the participants' preferences and availability. This flexibility ensures that the data collection process is as convenient and comfortable as possible for the participants, which can enhance the quality of the data collected. With the participants' consent, the interviews were audio-recorded to ensure accuracy in the data collection. Audio recording allowed the researcher to focus on the conversation during the interview and provided a reliable record of the conversation for subsequent analysis.

The primary data-collection process involved several key steps. **Participant Selection:** Participants were selected using purposive sampling, targeting individuals who were directly involved in the migration process. This ensured that the collected data were relevant and informative for the research objectives. **Interview Preparation:** Before interview, the researcher reviewed the interview guide and any relevant background information about the participants. This preparation helped the researcher ask informed and relevant questions during the interviews. **Conducting the Interview:** During interview, the researcher used active listening skills to facilitate conversations and ensure understanding. The researcher also took brief notes about the interview context and the participants' nonverbal cues. **Transcription:** After each interview, the researcher verbatim transcribed the audio recordings. The transcriptions were checked for accuracy and anonymized to protect participants' identities.

3.3 Data Collection Procedure

To ensure the reliability and validity of the data collected in this study, a systematic and organized data collection procedure was employed. This procedure consisted of several distinct stages: preparation, data collection, and data management.

Before embarking on the data-collection process, meticulous preparation was performed. This entails developing a comprehensive plan that delineates the methods of data collection, specific types of data to be gathered, and the sources from which the data will be obtained. Additionally, this plan encompasses the creation of specific instruments for data collection such as interview guides and templates for reviewing documents. Adequate permission and ethical approval were also sought during this preparatory phase to ensure compliance with the necessary regulations.

The data collection process involved a two-pronged approach, employing semi-structured interviews and document reviews. Depending on the participants' preferences and availability, interviews were conducted either in person or via video conferencing, guaranteeing maximum convenience. Prior to commencing the interviews, participants explicitly provided their consent for audio-recordings, a practice that not only ensured the accuracy of data collection, but also respected ethical considerations. The document review aspect of data collection entails a meticulous examination of relevant company reports, technical documents, and regulatory policies, utilizing a rigorous and systematic search strategy.

Once the data have been collected, they undergo a meticulous organization and management process to facilitate subsequent analysis. Audio recordings of the interviews were transcribed verbatim and subsequently crosschecked for accuracy. On the other hand, data from document reviews are meticulously summarized and organized in a manner that optimizes their suitability for analysis. Throughout this process, utmost care is taken to securely store all data, ensuring the safeguarding of confidentiality and privacy. In summary, the data collection procedure implemented in this study was meticulously designed to adopt a systematic and structured approach to maximize the reliability and validity of the research findings.

3.4 Data Analysis Methods

The data analysis in this study employed a blend of qualitative and quantitative methodologies, providing a comprehensive understanding of the network migration process. **Qualitative Data Analysis:** The Qualitative data gathered through interviews and document reviews were subjected to thematic analysis. This process involves coding the data, identifying and reviewing themes, defining and naming themes, and producing a report. Thematic analysis allows for in-depth exploration of the data, offering insights into the experiences, perceptions, and decision-making processes of the participants. **Quantitative Data Analysis:** The quantitative data collected through research of the data from company reports, radio equipment catalogs, and product specifications were analyzed using Analytic Hierarchy Process (AHP) statistical methods. Descriptive statistics were used to summarize the data, while inferential statistics were used to identify the relationships between the variables and test the hypotheses. Quantitative analysis provides a numerical representation of the data, facilitating an objective comparison and evaluation. The integration of qualitative and quantitative data analysis methods allows for a comprehensive and robust analysis of the data, thus enhancing the reliability and validity of the research findings.

4. Results and Discussions

4.1 Respondent Selection Criteria

Respondents were meticulously selected to ensure diverse and comprehensive representation of the perspectives of the network migration project. The selection criteria were as follows. **Customers:** Individuals or entities directly utilizing broadband wireless access services, chosen based on their usage patterns and the potential impact of network migration on their service experience. **Senior Management:** Executives within the company responsible for strategic decisions regarding network migration, including those with insights into its financial, operational, and competitive implications. **Project Managers:** Individuals tasked with oversight of the migration project, selected for their detailed knowledge of the project's objectives, challenges, and progress. **Technical Experts:** Specialists in network technology, particularly those with expertise in the 3.3 GHz and 10 GHz spectra, were selected for their ability to provide detailed technical analyses of the implications of migration.

4.2 Analysis of Interviews This section delineates the methodology adopted for qualitative data collection, which is pivotal in understanding the multifaceted dimensions of network migration from 3.3 GHz to 10 GHz. This approach encompasses the selection criteria for respondents, the interview techniques employed, and the subsequent data coding and analysis process. **Coding Methodology:** The first step in our analysis was to employ a coding process for the transcribed interviews. This involved a detailed review of the interview texts to identify and categorize the key pieces of information into codes. Coding was performed iteratively, starting with an initial set of codes derived from the research questions and objectives. As the analysis progressed, new codes were generated to capture emerging themes and insights, allowing for a more nuanced understanding of the interview data.

This coding process was instrumental in breaking down qualitative data into manageable segments for further analysis. **Thematic Analysis Approach:** Following the coding phase, a thematic analysis was conducted to identify patterns and themes across the coded data. This approach facilitated the organization of codes into broader themes that reflected the underlying narratives and insights within the data. Themes were developed by grouping related codes and examining their relationships, enabling a comprehensive exploration of the topics discussed by the interviewees. Thematic analysis was guided by both the research objectives and the insights that emerged organically from the data, ensuring that the analysis remained closely aligned with the study's aims while also being responsive to the data itself. The thematic analysis culminated in the identification of several key themes related to network migration, including customer perspectives on service disruption and communication, technical challenges and solutions encountered during migration, operational and strategic insights from project management, and the broader implications of migration for regulatory compliance and market competitiveness.

The combination of a methodical coding methodology and a thorough thematic analysis approach

provided a solid foundation for understanding the complex dynamics of the network migration process. This analytical framework has enabled the extraction of meaningful insights from qualitative data, shedding light on the experiences, challenges, and strategies associated with the migration from 3.3 GHz to 10 GHz. Through this analysis, this study offers valuable contributions to the field of network management and migration strategies, informed by rich qualitative data gathered from a diverse range of stakeholders involved in the migration process.

The Conclusion and Implications section synthesizes the key findings from the diverse interviews, highlighting the critical insights across customers, project management, senior management, and technical expert perspectives. This comprehensive analysis revealed pivotal factors influencing network migration success, including the importance of clear communication, robust planning, and stakeholder engagement.

4.3 Senior Management Insights

Discussions with executive leadership have provided profound strategic perspectives on the rationale and planning of the network frequency shift. The primary insights are as follows. Strategic Conformity: The transition is predominantly viewed as a strategic initiative aimed at reinforcing a firm's market competitiveness. Leadership underscored the imperative to evolve in response to technological progress and escalating demands of consumers for superior service quality. Operational and Financial Prospects: The migration's potential to augment operational effectiveness, diminish long-term expenses, and forge new avenues for revenue generation has been accentuated. Nonetheless, apprehensions regarding immediate fiscal repercussions and the necessity for considerable capital expenditures were voiced.

The viewpoints of senior management depict a strategic, yet guardedly positive stance on the ramifications of the network transition for the organization's prospective trajectory, with a keen focus on strategic alignment, service enhancement, regulatory compliance, and effective communication.



Figure 1. Senior Management Word Frequency
Source: Person data (2023)

4.4 Analytical Hierarchy Process (AHP) for Radio Equipment Selection The dynamic landscape of broadband wireless access (BWA) technologies is characterized by rapid advancements and ever-increasing demand for higher data speeds, improved reliability, and expanded coverage. As service providers strive to meet these demands, the adaptation and upgrading of radio-frequency equipment has become a critical task. A pivotal aspect of this adaptation is the frequency migration projects that many BWA companies undertake, such as the strategic migration from 3.3 GHz to 10 GHz. This transition is not merely a technical upgrade but also a fundamental shift aimed at unlocking new levels of network capacity, enhancing coverage across wider areas, and significantly boosting overall network performance.

However, migration to a higher frequency band is fraught with challenges, with the selection of

appropriate radio equipment being a particularly complex issue. This complexity is due to several factors. **Technical Compatibility:** Equipment must be compatible with a new frequency band. This involves not only the ability to operate at 10 GHz, but also to meet specific performance criteria that this higher frequency demands, such as beamforming capabilities, higher-order modulation schemes, and advanced error correction techniques. **Network Performance:** The selected radio equipment plays a crucial role in determining the ultimate performance of the network in terms of data throughput, latency, and reliability. At 10 GHz, radio waves behave differently compared with lower frequencies, with aspects such as propagation loss, penetration capabilities, and susceptibility to weather conditions becoming more pronounced. Therefore, the selection of equipment to mitigate these issues is crucial. **Cost-effectiveness:** Beyond technical performance, the cost of equipment and its return on investment is critical considerations. Equipment that is too expensive can make the migration project financially unviable, whereas cheaper, less capable equipment can lead to subpar network performance and customer dissatisfaction.

Future-proofing: The selected radio equipment should not only meet current needs but should also be adaptable to future technologies and standards. This includes compatibility with upcoming network protocols, scalability to support growing user bases, and the flexibility to enable new services and applications. **Regulatory Compliance:** Equipment must comply with local and international regulations governing the use of the 10 GHz band. This includes power output restrictions, spectrum sharing rules, and electromagnetic interference (EMI) standards, which are critical for lawful and harmonious operations within a broader communication ecosystem.

Given these considerations, the selection of radio equipment is not just a technical decision but also a strategic one that impacts the entire spectrum of a BWA company's operations, from network design and customer satisfaction to regulatory compliance and financial health. A careful methodical approach is required to ensure that the chosen equipment aligns with the company's long-term goals and operational strategies. This underscores the importance of employing a robust decision-making framework such as the Analytical Hierarchy Process (AHP) to navigate the complexities of radio equipment selection during the critical process of frequency migration.

4.5 Criteria Definition

The first step in applying the AHP framework is to define the criteria against which radio equipment options are evaluated. In this study, criteria were identified based on technical compatibility, operational efficiency, and financial viability. Each criterion is crucial to ensure that the selected radio equipment aligns with the company's strategic objectives and operational requirements in the context of frequency migration.

4.6 Priority Alternatives

Upon completing the Analytic Hierarchy Process (AHP) for the selection of radio equipment, the final priority values for the options were calculated. These values reflect the relative desirability of each option, considering all the criteria and sub-criteria evaluated in the decision-making process. The AHP process aids in decision making by quantifying the subjective assessments of each criterion's importance and the performance of each option against those criteria. The priority values are derived from the weighted sum of the options' performance across all criteria, where the weights are the relative importance of the criteria determined through pairwise comparisons.

The consistency of the decision matrix was maintained throughout the analysis, as evidenced by the consistency ratios across different criteria, which were generally low. This suggests that the judgements made in the pairwise comparisons are reliable and that there is a high level of consistency in the preferences expressed. In conclusion, Brand A emerges as the overall best option in this AHP analysis for radio equipment selection, with the highest priority value, followed by brands C and B, respectively. These results will guide the decision-making process, ensuring that the chosen equipment aligns closely with the strategic goals and operational requirements of the project or organization that makes the selection.

4.7 Business Solution

The analysis preceding this segment involved a thorough review of the organization's status in delivering a broadband wireless access network, employing tools such as SWOT analysis, qualitative evaluations, and other methodological assessments. This examination revealed a complex array of challenges and prospects. The principal concerns highlighted encompass technological constraints within the present 3.3 GHz to 10 GHz radio spectrum, variable regulatory frameworks, the necessity for infrastructure enhancement, and the requirement for strategic market positioning amidst intense competition.

The aim of this section is to delineate targeted business remedies designed to effectively address these challenges. It seeks to establish a unified strategy that not only addresses the risks and capitalizes on the strengths unveiled by the SWOT analysis, but also resonates with the organization's aspirations for enduring growth and resilience. This discussion explores strategic realignments, operational improvements, financial strategies, and customer engagement initiatives that are critical for a network's successful transition. The strategy outlined herein is intended to equip the organization with the means to proficiently manage the intricacies of this transition, while also obtaining a competitive edge within the dynamic digital marketplace.

4.8 Implementation Plan & Justification

Network migration from the 3.3 GHz band to the 10 GHz band is a strategic endeavor critical to PT. XYZ's future success. The implementation plan not only addresses the technical aspects of migration but also prioritizes stakeholder engagement and risk management to ensure a smooth transition. By following this plan, the PT. XYZ is poised to achieve its objectives, enhance its market position, and meet the evolving needs of customers in an increasingly digital world.

4.8.1 Implementation Plan

Network migration from the 3.3 GHz band to the 10 GHz band is a significant undertaking that requires meticulous planning and execution. To ensure clarity and coherence in the migration process, the plan was structured according to the 5 W +1H framework, which covers what, where, who, when, why, and how. This framework provides a comprehensive outline of the migration process and ensures that all the critical aspects are addressed systematically.

What: Network Migration to the 10 GHz Band

The core activity involves transitioning the PT. XYZ's existing wireless broadband network infrastructure and services from the 3.3 GHz frequency band to the 10 GHz band. This includes upgrading the hardware, software, and network protocols to support the new frequency band, ensuring that the network can deliver enhanced capacity, speed, and quality of service.

Where: Network Coverage Areas

Migration was implemented across all areas currently covered by PT. XYZ's network. Special attention will be paid to densely populated urban areas, where demand is highest, followed by a phased rollout to suburban and rural regions to ensure complete network coverage and service continuity.

Who: Stakeholder Involvement

1. PT. XYZ's Management and Technical Teams: Overseeing the migration strategy, execution, and quality assurance.
2. Employees: Technical and customer service roles require training in new technology and processes.
3. Customers: Informed and engaged throughout the migration process to manage expectations and address concerns.
4. Suppliers and Contractors: Providing the necessary equipment and expertise for network upgrades.
5. Regulatory Bodies: Ensuring compliance with all regulations governing the use of the 10 GHz band.
6. Investors and Shareholders: Keeping them updated on migration's progress and its impact on the company's financial health and market position.

When: Migration Timeline

The migration is planned to commence in Q2 2024, with an initial pilot phase in selected urban areas. Following a successful pilot, a phased rollout will begin in Q3 2024, aiming for complete migration across all regions by Q4 2025. This timeline allows for thorough testing, stakeholder engagement, and adjustments to unforeseen challenges. Please see Appendix C for a detailed timeline of the implementation.

Why: Rationale for Migration

Migration to the 10 GHz band is driven by the need to accommodate increasing data traffic, leverage technological advancements, comply with regulatory standards, and enhance customer satisfaction. This strategic position is PT. XYZ to meet future demand, improve service quality, and maintain a competitive edge in the telecommunications market.

How: Migration Execution

The migration process involved several key steps.

1. Infrastructure Assessment and Planning: Evaluate the current network infrastructure and identify upgrades needed for the 10 GHz band.
2. Stakeholder engagement: Communicates with all stakeholders, sets expectations, and addresses concerns.
3. Technical Training: Comprehensive training for employees on new technologies and processes.
4. Equipment Upgrade: Procure and install new hardware compatible with the 10 GHz band, including antennas, receivers, and network management systems.
5. Testing and Quality Assurance: Extensive testing is conducted to ensure that the upgraded network meets the performance and reliability standards.
6. Customer transition support: Offers support and guidance to customers during migration, minimizing disruption, and maintaining service quality.
7. Regulatory Compliance: Ensure that all changes meet regulatory requirements and obtain the necessary approval.
8. Feedback and Continuous Improvement: Gather feedback from all stakeholders and make adjustments as needed to optimize network performance and customer satisfaction.

By following this detailed plan, structured around the 5 W + 1H framework, PT. XYZ aims to execute seamless network migration that aligns with the company's strategic goals and stakeholder expectations. This plan not only addresses the technical aspects of migration, but also emphasizes the importance of stakeholder engagement and satisfaction, ensuring the long-term success of PT. XYZ, in the competitive telecommunications industry.

4.8.2 Justification of the Plan

Choose the implementation strategy for PT. XYZ's network migration to the 10 GHz band has been meticulously designed to align with the diverse interests of all key stakeholders identified in the stakeholder analysis. This section delves into the rationale behind the selected approach, emphasizing how it caters to the specific needs and expectations of each stakeholder group, while ensuring that the migration's overarching goals are achieved.

Alignment with Stakeholder Interests:

1. PT. XYZ's Management and Employees: The implementation plan prioritizes the minimization of operational disruptions and seamless transition of network operations to the new frequency band. By involving employees, especially those in technical roles, in the planning and execution phases, the plan ensures that the workforce is well prepared and adequately trained for changes. This approach not only aids in maintaining operational efficiency but also boosts employee morale and commitment by involving them in significant technological advancement within the company.
2. Regulatory Bodies: Compliance with regulatory standards and guidelines is the cornerstone of the implementation plan. By engaging with regulatory bodies from the outset and ensuring that all aspects of the migration meet regulatory requirements, the plan demonstrates PT. XYZ's commitment to responsible and compliant business practices. This alignment with regulatory interests facilitates a smooth migration process and reinforces PT. XYZ's reputation as a trustworthy

and reliable service provider.

3. **Investors and Shareholders:** The implementation plan has been formulated with keen awareness of its financial implications and the need for a positive return on investment. By carefully planning migration to ensure efficiency and effectiveness, the strategy aims to enhance PT. XYZ's market position and profitability in the long term. This approach aligns with investors' and shareholders' interests in financial stability and growth, securing continued support and confidence in the company's strategic direction.
4. **Customers:** At the heart of the implementation plan is the commitment to enhance service quality and reliability, which directly aligns with customers' primary interest in uninterrupted and high-quality services. The phased migration strategy, coupled with comprehensive communication and support for customers, ensures that service disruptions are minimized and any potential concerns are promptly addressed. This meticulous attention to customer experience underscores PT. XYZ's dedication to customer satisfaction and loyalty.
5. **Suppliers and Contractors:** The plan involves close collaboration with suppliers and contractors to ensure that the necessary equipment and services for migration are of high quality, cost-effective, and delivered on schedule. By establishing clear expectations and fostering strong partnerships, the plan aligns with suppliers' and contractors' interests in business growth and success, thus ensuring mutual benefits from the migration project.
6. **Competitors:** Recognizing the competitive landscape of the telecommunications industry, the plan was designed to position PT. XYZ as a leader in leveraging advanced technologies for service enhancement. Migration to the 10 GHz band is not only a technical upgrade but also a strategic move to gain a competitive advantage. This proactive approach signals competitors' PT. XYZ's commitment to innovation and excellence potentially influences the industry's competitive dynamics.

The justification for the chosen implementation plan lies in its alignment with the diverse interests of key stakeholders, its strategic approach to managing the complexities of migration, and its focus on achieving long-term benefits for PT. XYZ and its stakeholders. This well-founded rationale ensures that the network migration to the 10 GHz band is positioned for success, paving the way for PT. XYZ's continued growth and leadership in the telecommunications industry.

5. Conclusion

PT. XYZ's migration from the 3.3 GHz to the 10 GHz band represents a pivotal strategic initiative aimed at enhancing service quality, operational efficiency, and regulatory compliance in a rapidly evolving telecommunications market. Through the integration of SWOT analysis, stakeholder insights, qualitative data, and the Analytical Hierarchy Process (AHP), the migration is shown to be both a growth opportunity and a complex undertaking. The decision to shift to the 10 GHz band positions PT. XYZ to capitalize on improved broadband capabilities and expand its competitive footprint, meeting growing market demands while setting the stage for future innovation and service diversification.

Despite the strategic potential, the migration presents significant technological, operational, regulatory, and financial challenges. SWOT analysis identifies infrastructure investment and frequency-specific vulnerabilities as critical weaknesses. Stakeholder and Qualitative Data Analyses emphasize the importance of managing workforce readiness, system integration, and regulatory expectations. Regulatory compliance emerges as both a threat and a strategic lever, requiring continuous engagement with authorities and proactive adaptation to policy changes. Financially, the transition demands substantial capital outlay, and success hinges on effective resource management, investor confidence, and the ability to monetize new service opportunities such as IoT and high-speed data services.

The use of AHP proves instrumental in navigating these challenges by providing a structured, data-driven approach to prioritize decisions—particularly in selecting technically compatible and financially viable equipment. AHP complements SWOT and stakeholder analyses by aligning operational needs with strategic goals and facilitating more precise implementation planning. Overall, the migration's success depends not only on technological upgrades but also on how well PT. XYZ integrates operational efficiency, financial strategy, stakeholder alignment, and regulatory responsiveness into its

execution. This comprehensive approach ensures sustainable growth, improved customer satisfaction, and long-term competitiveness in the dynamic telecommunications sector.

Limitations and Future Study

This study is limited by its reliance on qualitative assessments and structured decision-making tools that may not fully capture dynamic market or regulatory shifts. Additionally, the scope did not include real-time performance data post-migration, which could further validate the strategic assumptions. Future research should explore post-implementation metrics, long-term ROI, and comparative case studies with similar spectrum transitions to enrich strategic planning and operational benchmarking.

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References

- Astuti, C. C., Sari, H. M. K., & Azizah, N. L. (2020). Evaluasi E-learning Menggunakan Analytical Hierarchy Process (AHP). *BAREKENG: Jurnal Ilmu Matematika dan Terapan*, 14(1), 1-12. doi:<https://doi.org/10.30598/barekengvol14iss1pp001-012>
- Aulia, B. W., Rizki, M., Prindiyana, P., & Surgana, S. (2023). Peran Krusial Jaringan Komputer dan Basis Data dalam Era Digital. *Jurnal Sistem Informasi dan Teknologi Informasi*, 1(1), 9-20. doi:<https://doi.org/10.33197/justinfo.vol1.iss1.2023.1253>
- Azhari, F. (2024). SWOT Analysis in Business Development at Property Company PT. XYZ. *Siber Journal of Transportation and Logistics*, 1(4), 158-163. doi:<https://doi.org/10.38035/sjtl.v1i4.147>
- Bernroider, E. (2002). Factors in SWOT Analysis Applied to Micro, Small-to-Medium, and Large Software Enterprises: an Austrian Study. *European Management Journal*, 20(5), 562-573. doi:[https://doi.org/10.1016/S0263-2373\(02\)00095-6](https://doi.org/10.1016/S0263-2373(02)00095-6)
- Cooper, O. (2017). The Magic of the Analytic Hierarchy Process (AHP). *International Journal of the Analytic Hierarchy Process*, 9(3), 372-379. doi:<https://doi.org/10.13033/ijahp.v9i3.519>
- Creswell, J. W., & Creswell, J. D. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. New York: Sage Publications.
- Fahmi, M. A., Kostini, N., Barqin, G. A., & Juliandri, I. R. (2023). Analisis Green Marketing Terhadap Eco-Friendly Product pada Convenience Store Menggunakan Metode SWOT. *Jurnal Kewirausahaan, Akuntansi dan Manajemen TRI BISNIS*, 5(2), 109-123. doi:<https://doi.org/10.59806/tribisnis.v5i2.278>
- Fountzoula, C., & Aravossis, K. (2021). Analytic Hierarchy Process and Its Applications in the Public Sector: A Review. *Academy of Accounting and Financial Studies Journal*, 25(6), 1-15.
- Habibillah, R., & Hadjri, M. I. (2023). Pengaruh Perkembangan Teknologi di Era Digital bagi Pengembangan Sumber Daya Manusia di Daerah Tertinggal di Indonesia. *Jurnal Bisnis dan Pemasaran Digital*, 2(2), 115-125. doi:<https://doi.org/10.35912/jbpd.v2i2.2600>
- Irawan, C. R. (2024). SWOT Analysis as a Company Strategy for Business Competition. *Siber Journal of Transportation and Logistics*, 1(4), 164-171. doi:<https://doi.org/10.38035/sjtl.v1i4.158>
- Kumar, S., & Praveena. (2023). SWOT Analysis. *International Journal of Advanced Research (IJAR)*, 11(9), 744-748. doi:<https://dx.doi.org/10.21474/IJAR01/17584>
- Lim, A. L. (2020). Analisis SWOT dalam Menentukan Posisi Kompetitif (Studi Kasus PT Wahana Prima Anugerah di Pontianak). *MABIS*, 11(2), 95-106.
- Mashuri, & Nurjannah, D. (2020). Analisis SWOT Sebagai Strategi Meningkatkan Daya Saing (Studi pada PT. Bank Riau Kepri Unit Usaha Syariah Pekanbaru). *JPS (Jurnal Perbankan Syariah)*, 1(1), 97-112. doi:<https://doi.org/10.46367/jps.v1i1.205>
- Nababan, L., & Sinambela, L. (2024). Sistem Pendukung Keputusan Pemilihan Desa Terbaik Menggunakan Metode AHP (Analytic Hierarchy Proses) di Kecamatan

- Sidikalang. *Inventor: Jurnal Inovasi dan Tren Pendidikan Teknologi Informasi*, 2(2), 82-90. doi:<https://doi.org/10.37630/inventor.v2i2.1565>
- Paroli, Sugiat, J., & Rusdian, S. (2023). The Strategic Tech Horizons: A Comprehensive SWOT Analysis of Organizational Technology Integration. *Ambidextrous Journal of Innovation Efficiency and Technology in Organization*, 1(1), 18-24. doi:<https://doi.org/10.61536/ambidextrous.v1i01.32>
- Popescu, F., & Scarlat, C. (2015). Limits of Swot Analysis and Their Impact on Decisions in Early Warning Systems. *SEA: Practical Application of Science*, 3(1), 467-472.
- Putra, I. G. N. A. B. (2017). Analisis SWOT Sebagai Strategi Meningkatkan Keunggulan pada UD. Kacang Sari di Desa Tamblang. *Jurnal Pendidikan Ekonomi Undiksha*, 9(2), 397-406. doi:<https://doi.org/10.23887/jipe.v9i2.20106>
- Relina, M., Rasya, N. A., & Falayati, R. (2021). Analisis SWOT Sebagai Strategi Perusahaan dalam Memenangkan Bisnis pada Rumah Kebaya Nora Modeste dan Butiq Pekanbaru. *RAJ (Research in Accounting Journal)*, 1(3), 331-342. doi:<https://doi.org/10.37385/raj.v1i3.300>
- Rijali, A. (2018). Analisis Data Kualitatif. *Alhadharah: Jurnal Ilmu Dakwah*, 17(33), 81-95. doi:<https://doi.org/10.18592/alhadharah.v17i33.2374>
- Ruslin, Mashuri, S., Rasak, M. S. A., Alhabsyi, F., & Syam, H. (2022). Semi-Structured Interview: A Methodological Reflection on the Development of a Qualitative Research Instrument in Educational Studies. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 12(1), 22-29. doi:<http://dx.doi.org/10.9790/7388-1201052229>
- Saaty, T. L. (1980). *The Analytic Hierarchy Process*. New York: McGraw-Hill.
- Tambaani, L., Mandey, S. L., & Mandagie, Y. (2024). Analisis dalam Menentukan Strategi Pemasaran di Rumah Makan Istana Laut Manado. *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis dan Akuntansi*, 12(1), 998-1007. doi:<https://doi.org/10.35794/emba.v12i01.53928>
- Tavana, M., Soltanifar, M., & Santos-Arteaga, F. J. (2023). Analytical Hierarchy Process: Revolution and Evolution. *Annals of Operations Research*, 326(2), 879-907. doi:<https://doi.org/10.1007/s10479-021-04432-2>
- Ulinuha, M., Fatmawati, W., & Marlyana, N. (2023). Strategi Pemasaran dengan Pendekatan SWOT, Strengths, Weaknesses, Opportunities, Threats (Studi Kasus pada Walet Kofie). *Jurnal Ilmiah Sultan Agung*, 2(2), 75-91.
- Wahyuningtias, D., & Chung, D. (2022). Analysis of Strengths, Weaknesses, Opportunities, Threats (SWOT) on Business Development (Case Study on Nyokap Pempek). *Jurnal Industri Pariwisata*, 5(1), 1-16. doi:<https://doi.org/10.36441/pariwisata.v5i1.982>
- Yatminiwati, M., & Ermawati, E. (2021). Analisis SWOT dalam Menentukan Strategi Pemasaran dalam Upaya Meningkatkan Penjualan Produk. *JUMPA (Jurnal Manajemen dan Penelitian Akuntansi)*, 14(2), 105-114. doi:<https://doi.org/10.58431/jumpa.v14i2.217>
- Zainuri, R., & Setiadi, P. B. (2023). Tinjauan Literatur Sistematis: Analisis SWOT dalam Manajemen Keuangan Perusahaan. *Jurnal Maneksi (Management Ekonomi dan Akuntansi)*, 12(1), 22-28. doi:<https://doi.org/10.31959/jm.v12i1.1364>