Analysis of Information Technology Service Management for Radio Frequency Spectrum Licensing Services at Balmon Palembang Using ITIL V3

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ABSTRACT

This research discusses the importance of timely, accurate, and relevant information technology services to support organizational activities, particularly in the context of radio frequency spectrum licensing services. The lack of government oversight of IT services often leads to complaints, necessitating evaluation using the ITIL framework. The study seeks to examine how ITIL V3 processes are applied within radio frequency spectrum licensing services at Balmon Palembang through a qualitative descriptive method. Findings suggest that the services have implemented ITIL V3 processes with a maturity level at level 3 Defined.

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1. Introduction

Radio frequency spectrum is defined as a natural asset which has limited resources [8] and has important value in telecommunication operations, and is controlled by the government. Utilizing the radio frequency spectrum, a valuable natural resource, should be managed efficiently and systematically according to its designated purposes to prevent interference and limitations that result in losses.. The use of radio frequency spectrum covers a variety of needs, such as in the management of telecommunications networks, navigation and safety services, broadcasting, telecommunications, [12] the benefits are felt by the community. For this reason, it is necessary to organize Utilizing the radio frequency spectrum through licensing services for its utilization.

The existence of complaints related to information technology services is evidence that the central government does not monitor this aspect. The level of excellence of information depends on three factors, namely accuracy, timeliness, and relevance [29]. [30] explains that an information system is a structured entity consisting of humans, software, hardware, communication networks, and data resources that work together to collect, process, and disseminate information within an organization.

Therefore, it is necessary to evaluate information technology services, especially those associated with authorizing the utilization of the radio frequency spectrum, to ensure efficient use of resources, security of organizational assets, improvement of service management systems, and effective achievement of organizational goals.

Evaluation has the main purpose of assessing the effectiveness and success of system implementation, and to ensure the achievement of organizational goals. One evaluation method that is very useful in the context of information technology service management is the framework known as ITIL (Information Technology Infrastructure Library). ITIL is known as a structured collection of guidelines and principles that provide direction for organizations in managing information technology services efficiently.

Implementing the ITIL framework provides careful guidance in ensuring that information technology systems operate in accordance with established standards and provide optimal support for organizational goals. With a focus on service management, ITIL helps organizations to identify and overcome obstacles, improve operational efficiency, and provide high-quality services to end users. Thus, through evaluation using the ITIL framework, organizations can assess the success of information technology implementation and ensure effective achievement of their goals [16].

The results of the study [1] show that in the planning of information technology service management at Palembang class I radio frequency spectrum monitoring center, seven key processes were identified using the COBIT 2019 framework. These processes include EDM02 Ensuring Benefit Delivery, APO02 Strategy Management, APO05 Portfolio Management, APO09 Service Management, BAI03 Solution Identification and Improvement Management, BAI05 Organizational Change Enablement Management, and DSS01 Operations Management. From these findings, it can be concluded that the use of the COBIT 2019 framework is an effective foundation in managing information technology services in the organization, by accommodating various important aspects such as strategy, portfolio, services, solution identification and improvement, organizational change empowerment, and operations.

ITSM (Information Technology Service Management) refers to a well-organized and well-described set of services, which focuses on aspects of managing IT infrastructure, elements, and business applications and related processes. [9]. Its main purpose is to provide vendor-independent support and cover the entire spectrum of IT services. ITIL serves as the cornerstone for managing information technology, with an emphasis on measurement aspects and continuous efforts to improve the quality of IT services. These improvements are not only beneficial from a business perspective, but also from the customer's point of view. The focus on the measurement and continuous improvement aspects is a key marker of successful ITIL implementation, providing significant benefits to organizations that are developing their techniques and processes. [4].

In this case, the author uses references to several previous studies that analyze the use of the ITIL version 3 framework in licensing agencies in various lines, including research in a study entitled "Evaluation of the Effectiveness of the Implementation of the Online Single Submission (OSS) System at DPMPTSP Lubuklinggau City with the ITIL V3 Framework Approach", the assessment is based on the ITIL Version 3 framework in the Service Operation Domain of the Event Management Sub Domain. The results of the research analysis show that overall, the data shows the average value of the level of maturity within the Service Operation domain stands at 4, with a percentage reaching 73.25%. These results indicate that there are several processes related to implementation and understanding by licensing service operations through the Online Single Submission (OSS) System for people who do business and DPMPTSP employees of Lubuklinggau City. Maturity level 4 referred to as "managed" indicates that the related processes have been planned, implemented regularly, and documented according to standards. In addition, the process has been measured for performance [25].

In addition, it was concluded that 64.45% of the participants gave a rating of 5, indicating that the implementation of the *Online Single Submission* System (OSS) has reached a satisfactory level. The recommendations given emphasize more on creating documentation to ensure all service management activities can run smoothly as expected [5]. Another study, namely with the title "Service Audit of the Information System for the Use of *Online* Foreign Workers Using the ITIL V.3 Framework in the *Service Operation Domain* (Case Study: PT. Seokhwa Indonesia)." This research involves evaluating IT services at PT Seokhwa Indonesia to assess the extent to which these services conform to enhanced methodologies within the ITIL V3 framework, there is a section called *Service Operation*, which focuses on several aspects such as Enhancing and expanding upon the following services: Problem Management, Incident Management, Access Management, Request Fulfillment, and Event Management. Evaluation is done through four stages, namely Planning, Direct Observation, Reporting, and Follow-up.

The framework in this research is adopted from the *Keylink*, *Input* and *Output of* the ITIL V3 Life Cycle itself, as follows:

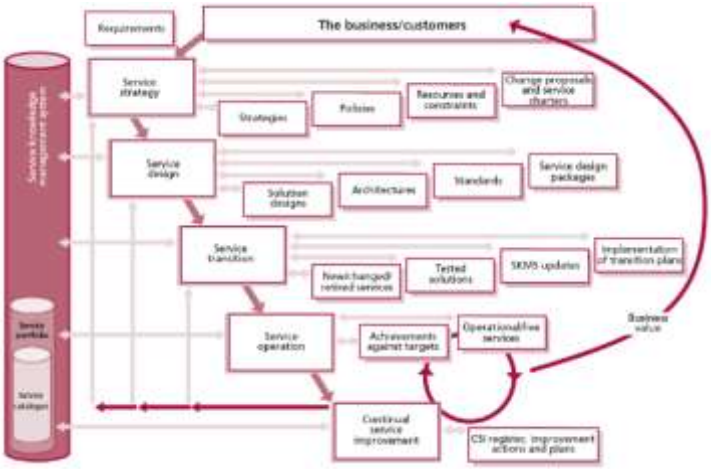

Fig. 1. Keylinks, Inputs and Outputs of the ITIL v3 Lifecycle

The mindset in this study is based on the conceptual framework in the following figure:

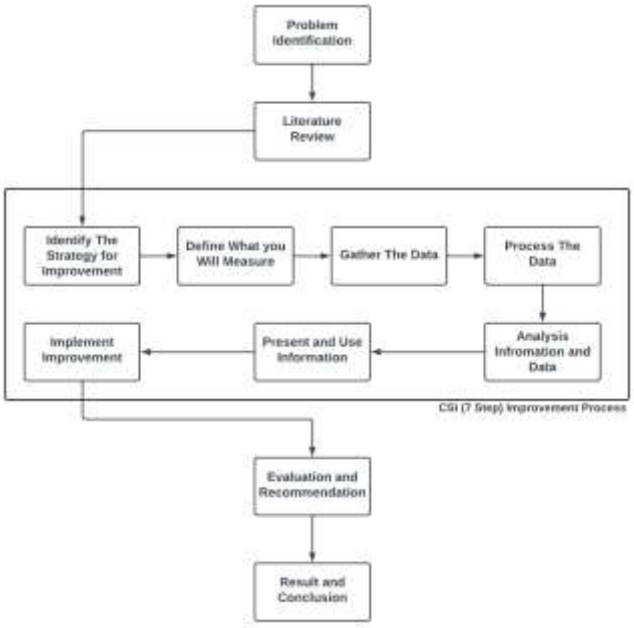

Fig. 2. Thinking Framework

2. Method

2.1. Research object

This research will be located in the service area of Class I Radio Frequency Spectrum Monitoring Center Palembang, namely the province of South Sumatra and will be devoted to users in the city of Palembang and its surroundings. This research focuses on licensing processes associated with the assignment, utilization, and supervision of radio frequency spectrum. The object of the research includes all stages in the licensing process, ranging from licensing applications, application evaluation, change management, to monitoring and renewal of radio frequency spectrum licenses. This research took an ITSM approach using the ITIL version 3 framework to analyze and improve the efficiency, reliability, and user satisfaction of this radio frequency spectrum licensing service.

2.2. Data Collection

The author uses data collection as a tool to gather information related to the research. The initial stages of the research involved the process of collecting primary data and searching for secondary data. Primary data needed was the condition of radio frequency spectrum licensing services which was to find out information about the condition of information technology in Balmon Palembang. Then the guidelines, standards, and performance instructions about the licensing service management process and management of the request fulfillment process. While the secondary data needed is the organizational structure for the identification needs of each stakeholder and their role in the organization.

The data collection methods are:

- Interview.

  [3] defines an interview as a rendezvous between two individuals intending to share information and ideas through a dialogue of questions and answers, thereby facilitating the comprehension of a specific topic through mutual exchange. Through interviews, researchers can attain a more profound comprehension of how individuals perceive circumstances and occurrences, which cannot be acquired solely through observation [27].

- Observation.

  The observation research method is an approach used to observe and collect data about the phenomenon or event being studied. In this method, the researcher actively observes the behavior, interactions, or circumstances of the research subject directly, both in a natural environment (natural setting) and in a controlled environment (controlled setting) [27].

- Documentation.

  Documentation is the process of recording and storing information about events or activities that have occurred, which includes pictures, monumental works, and writings from individuals. In the context of this research, this technique is used to collect data regarding the organizational structure, records related to organizational processes, and record researcher activities during observations and interviews. This helped in obtaining detailed and accurate information about the subject of the research, as well as enabling in-depth analysis of the processes and activities observed.

2.3. Research Instruments

On the other hand, to ascertain the research sample, purposive sampling methodology was employed, which was selected according to predetermined considerations and in line with the research objectives. Here are two examples of research instruments:

- Experts or expert respondents are individuals with responsibility for various processes in radio frequency spectrum licensing services.

Table 1. Expert Respondents

No	Position	Number of Samples
1	Head of the Palembang Class I Radio Frequency Spectrum Monitoring Center	1
2	Radio Frequency Monitoring System Infrastructure Maintenance and Public Consultation Team Leader	1
3	Operations and Service Data Manager	1
4	Frontliner	1
Total		4

- User is a person who uses radio frequency spectrum licensing services.

Table 2. User Respondents

No	*Client Name*	Jenis Layanan	Jumlah
1	RADIO LANUGRAHA SWARA INDAH	Broadcasting	1
2	GRAND CENTRAL HOTEL, PT.	Land Mobile	1
3	TELEKOMUNIKASI SELULAR, PT.	Fixed Service	1
4	DISTRIK NAVIGASI KELAS I PALEMBANG	Maritime	1
Total			4

2.4. Research Type

This study falls under qualitative research, employing a descriptive methodology. In accordance with the opinion [27], qualitative research aims to explore an in-depth understanding of natural phenomena. This approach is often used to understand the experiences, perceptions, and interpretations of research subjects in the context of everyday life.

This study employs a descriptive qualitative data analysis approach, incorporating observation and interviews as methods for data gathering. This method is done to gain a deep understanding of the phenomena observed by paying attention to the details and context involved. Observation was used to directly observe behaviors and interactions, while interviews were used to gain views and understanding from the perspective of the research subjects. The combination of these two techniques allowed the researcher to obtain rich and detailed data about the research subject in a natural context.

2.5. Research samples

Samples were taken from the population as research subjects before starting the interview, observations were made of the object of research to determine the focus area of ITIL version 3. The interview questions were centered around specific points. The results of the interviews were then processed and identified according to related data or documents. The goal is to ensure that the answers given can be obtained evidence that can be accounted for.

3. Results and Discussion

3.1. Results

In the radio frequency spectrum licensing service, ITIL processes will be involved in IT service management that focuses on providing radio frequency spectrum licensing. The following is a more complete process of the ITIL process in the service:

- Service Strategy

  From the interview with the head of Balmon Palembang, it can be seen that there are financial management activities set by the organization for public services. This is in line with the observation of the SDPPI 2020-2024 strategic plan document [2], which states that the Directorate General of SDPPI has designed an activity program to achieve the 2020-2024 target. The program target related to public services is to improve the quality of service delivery and management of PNBP with a work plan in the form of organizing public services in the frequency sector.

Table 3. PNBP Targets

PNBP	Target 2020	Target 2021	Target 2022	Target 2023	Target 2024
PNBP bidang frekuensi dan perangkat pos dan informatika	16,359,880,331	19,243,782,013	19,143,613,126	19,354,772,921	20,244,298,663

While the indication of funding for the Directorate General of SDPPI 2020-2024 work program specifically for the implementation of public services in the field of frequency and ICT devices is:

Table 4. Indication of Program Funding Needs of DG SDPPI 2020-2024

Program/Kegiatan	2020	2021	2022	2023	2024
Penyelenggaraan Layanan Publik Bidang Frekuensi dan Perangkat TIK	179.232	228.235	467.993	779.266	253.022

* satuan dalam jutaan rupiah

Then still in the process of financial management from the results of interviews with the head of Balmon Palembang in the scope of pricing policy is also set [11]. BHP or known as Radio Frequency Spectrum Usage Right Fee for ISR (Intelligence, Surveillance, and Reconnaissance) is calculated by considering technical and zonal parameters using the following formula (Calculation of Radio Frequency Spectrum BHP):

$$\text{BHP Frekuensi Radio (Rupiah)} = \frac{(Ib \times HDLP \times b) + (Ip \times HDDP \times p)}{2}$$

Description:

b = the width of the frequency band used (bandwidth)

P = large antenna output transmit power (EIRP)

Ib = bandwidth occupancy cost index

Ip = frequency transmit power cost index

HDLP = bandwidth base price

HDDP = base price of transmit power

Certain findings from the preceding analysis align with the three core financial management activities outlined in ITIL V.3 for IT services[7], namely:

1. Funding: Predicting the expected future cost budget requirements by achieving agreed service objectives and monitoring compliance with the set budget.
2. IT Accounting: Empowers the organization to thoroughly track and analyze its expenditure.
3. Chargeback: Charging customers for the use of the Service. Notional charging presents a specific alternative where the cost of delivering the service to the customer is disclosed without necessitating actual payment.

In the service portfolio management process, based on the observation of the SIMS Infrastructure document, it can be seen that DG SDPPI has identified user needs related to radio frequency spectrum licensing, both from the private sector and the government. DG SDPPI has performed the function of radio frequency licensing services since the frequency management information system has not been operated, namely by manual recording. The introduction of management information system to run the spectrum licensing process began in 1998 with the construction of AFMS(Automated Frequency Management System) Phase I and continued Phase II in 2004 in cooperation with Spectrocan as a system developer from Canada. Along with the development of information technology, the demand for radio frequency spectrum services has increased.

Fig. 3. Fig 3 Stages of Spectrum Management Information System Development

The aforementioned findings align with the goals set forth by the service portfolio management process outlined in ITIL V.3 [7], The aim is to offer strategic guidance and oversee investments in IT Service Management (ITSM) to ensure the ongoing maintenance and sustenance of the optimal service portfolio. Additionally, it seeks to uphold precise records regarding planned, existing, and terminated services.

- Service Design

The service level management process has implemented a service level agreement (SLA), which is known by the lack of complaints from licensing service users in accessing the radio frequency spectrum licensing service application. This is also confirmed by the observation of the SIMS 2022 document that after user needs are identified, DG SDPPI has prepared an effective and efficient licensing process by preparing SIMS. In terms of its function, SIMS is a very vital and key instrument. Currently, the SIMS service can now be accessed online by all radio frequency users. The licensing process which includes applying for a new license, extension, modification, warehousing can already be carried out online and independently by the user. Consequently, SIMS is required to be accessible online 24/7 in accordance with the operational service level agreement set at 99% uptime.

This aligns with the objective of the service level management process outlined in ITIL V.3 [7] the objective is to guarantee the fulfillment of agreed-upon service levels for existing services while aligning the provision of future services with the attainment of agreed-upon targets. Additionally, organizations actively pursue and execute enhancements to the quality of service delivered to users.

Furthermore, entering the availability management process, it is known that in the radio frequency spectrum licensing service, several availability management activities have been determined in the organization, namely service component monitoring and availability analysis. This is in accordance with the results of observations of SIMS 2022 documents.

This is in accordance with the purpose of *availability management* in ITIL V3 [7] to verify that the services provided by an organization are available for use by users according to predetermined needs.

- Service Transition

Interviews with the Head of the team responsible for maintaining the radio frequency monitoring system infrastructure as well as the public consultation organizer showed that prior to the licensing process being fully implemented, DG SDPPI had conducted testing and validation to ensure that the process was running as planned.

In the knowledge management process, relevant staff have also been trained to use the licensing system and understand the procedures that have been established through technical guidance activities. This aligns with the objective of the knowledge management process outlined in ITIL V3 [7], namely to ensure the existence of appropriate knowledge at the appropriate time and to the appropriate individuals to maintain a common understanding of the services available and improve the efficiency and quality of these services.

During the process of change management, as per the examination of SIMS 2022 documents, it is known that there are several change management activities established in the organization, namely recording change requests, change assessment, change planning, and change implementation review. One of the changes made is the migration of the old SIMS to the New Generation SIMS which was carried out in 2003, the migration was carried out on the business process engine, database from Oracle to opensource database, interface and overall system architecture. This migration is expected to make the New Generation SIMS more automatable, scalable, adaptable, workflow driven, service based architecture (microservice) and web-based. The following are the SIMS development milestones that have been and will be carried out from 2020 - 2024 where all of these changes have been determined according to established standards.

This aligns with the objective of the change management process outlined in ITIL V3 [7] which is to ensure only standardized methods are used to handle, implement, and document all IT-related changes. Standardization helps organizations maintain control over change and reduce business risk.

In the service validation and testing process , the results of interactions with the Head of the team responsible for maintaining the radio frequency monitoring system infrastructure and conducting public consultations can be seen that before the changed migration is implemented for the organization's operational activities, the latest generation radio frequency spectrum licensing service must first pass the validation stage to ensure that the validation process is carried out to reduce potential risks by ensuring that the new system is in line with business needs for the institution. After the system is implemented. For organizations, system testing is always carried out to reduce the possibility of errors or bugs that may appear, so that the system can function optimally. This statement is reinforced by information to Balmon Palembang that for system trials, an event notice is generally issued so that it can be seen the extent of the system's functionality and applies to each UPT. As for the service validation and testing results document, it cannot be obtained because it is confidential.

This aligns with the objective of the service validation and testing process outlined in ITIL V3 [7], which aims to guarantee that newly introduced or modified services deliver suitable value to customers and their respective businesses.

- Service Operation

Once the licensing process is in the operational stage, Balmon Palembang is directly involved in running the process on a routine basis. This includes receiving and handling new applications, renewing existing licenses, as well as monitoring the performance of the licensing process and handling any licensing-related incidents that may occur.

Based on the results of interaction via interviews with operations and services data managers and front line officers as the first support to help users handle complaints related to radio frequency spectrum licensing services, it can be seen that the service desk function in receiving incidents reported by customers already exists. It can be seen that if there is an obstacle or a change in the status of an incident, the service desk informs the customer with telephone media and whatsapp applications for massive incidents. However, with the information obtained, it can also be seen that there is no separate technology to support the performance of the service desk, only limited to telephone and WhatsApp applications. Then in carrying out its operations, there is no SLA set for the service desk in handling each incident, there is no routine report produced from the service desk officer on the list of reported incidents. This is in accordance with the information obtained from the interview with the head of Balmon Palembang that there has been no weekly review carried out by the management to highlight the reported incidents because there is no routine report from below.

Meanwhile, in terms of incident management and problem management, based on interviews, there are no processes available at all. In this service operation domain, there are not many documents that can be a reference for proving service operation activities, activities are carried out as they are. This is contrary to the benefits of the incident management process in ITIL V3 [7], the objective is to swiftly resume regular service operations. Additionally, the

advantages of the problem management process in ITIL V3 include the eradication of recurring incidents.

- Continual Service Improvement (CSI)

From the results of the interview with the Head of Balmon Palembang, it can be seen that for the process of continual service improvement, nationally there has been a perception of public services measured through a public satisfaction survey which aims to evaluate the performance of service units, one of which is the radio frequency spectrum.

From the SDPPI strategic plan document, the performance level of the Directorate General of SDPPI 2020-2024 is also known with the program target of improving the quality of service delivery and PNBP management, in the table below:

Table 5. Performance Targets of DG SDPPI 2020-2024

Sasaran Program /Indikator Kinerja			Manual Pengukuran Indikator	satuan	2020	2021	2022	2023	2024
Program Pengelolaan Spektrum Frekuensi, Standar Perangkat dan Layanan Publik									
Sasaran Program 1			Meningkatnya Kualitas Penyelenggaraan Layanan dan Pengelolaan PNBP						
IKSS 5.6	IKP 1.2	Indeks Kepuasan Masyarakat terhadap pelayanan publik bidang frekuensi dan perangkat pos dan informatika	Pelaksanaan survei indeks kepuasan masyarakat terhadap pelayanan publik Ditjen SDPPI	Nilai	>3,5	>3,5	>3,5	>3,5	>3,5
IKSS 5.6	IKP 1.5	Indeks integritas pelayanan publik bidang frekuensi dan perangkat pos dan informatika	Pelaksanaan survei indeks integritas pelayanan publik Ditjen SDPPI	Nilai	≥ 8,2	≥ 8,2	≥ 8,2	≥ 8,2	≥ 8,2
IKSS 5.5	IKP 1.7	Jumlah target PNBP bidang frekuensi dan perangkat pos dan informatika	Capaian target PNBP bidang BHP frekuensi radio yang ditetapkan setiap tahun	Rp	16.359.880. 331.000	19.243.782. 013.000	19.143.613. 126.729	19.354.772. 921.688	20.244.298. 663.441

From the table above, it can be seen that in carrying out radio frequency spectrum licensing services, DG SDPPI pays attention to the public satisfaction index and integrity index for public services in the field of postal and informatics frequencies and devices.

The findings align with the goals of the ongoing service enhancement procedure outlined in ITIL V3 [7], emphasizing the importance of recognizing and executing enhancements across the service life cycle to accommodate evolving business requirements. Enhancements to services should target enhanced efficiency, heightened effectiveness, and the optimization of service expenses along with the fundamental service management procedures.

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3.2. Discussion

The maturity level of radio frequency spectrum licensing services is the processing of each selected ITIL process that has been classified as a focus area that refers to the answers from the interview session with the following number of questions:

Table 6. Number of Questions per ITIL V3 Process

Tingkat layanan	Proses IT-IL	Jumlah Pertanyaan
Service Strategy	*Financial Management*	52
	Service Portfolio Management	45
Service Design	*Service Level Management*	36
	Availability Management	45
Service Transition	*Knowledge Management*	46
	Change Management	56
	Service Validation and Testing	48
Service Operation	*Service Desk*	48
	Incident Management	47
	Problem Management	50
TOTAL		**473**

Each process has been assessed for IT service maturity with the following results:

Table 7. Maturity of IT services: Financial Management

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+1	4	6	6	0	**PASS**	**10**
3.	*Level 2: Process Capability*	M+3	24	30	30	0	**PASS**	**40**
4.	*Level 2.5: Internal Integration*	M+1	3	4	4	0	**PASS**	**44**
5.	*Level 3: Products*	M+1	3	4	4	0	**PASS**	**48**
6.	*Level 3.5: Quality Control*	M+1	5	6	6	0	**PASS**	**54**
7.	*Level 4: Management Information*	M+2	12	16	16	0	**PASS**	**70**
8.	*Level 4.5: External Integration*	M+2	27	30	30	0	**PASS**	**100**
9.	*Level 5: Customer Interface*	M+2	5	5	0	5	**FAIL**	**100**
		Total Skor	**86**	**105**	**100**	**5**		

Table 7 shows that the maturity of radio frequency spectrum licensing services in the *financial management* process stops at level 4.5 *external integration*. The score with pass status amounted to 100 points and the total score achieved amounted to 105 points with a difference of 5 points to pass perfectly. This achievement falls into the *Average Comply* category.

Table 8. Maturity of IT services: Service Portfolio Management

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	4	6	6	0	**PASS**	**6**
2.	*Level 1.5: Management Intent*	M+1	3	4	4	0	**PASS**	**10**
3.	*Level 2: Process Capability*	M+1	12	16	16	0	**PASS**	**26**
4.	*Level 2.5: Internal Integration*	M+1	5	6	5	1	**PASS**	**31**
5.	*Level 3: Products*	M+1	4	6	6	0	**PASS**	**37**
6.	*Level 3.5: Quality Control*	M+1	5	6	6	0	**PASS**	**43**
7.	*Level 4: Management Information*	M+1	3	12	11	1	**PASS**	**54**
8.	*Level 4.5: External Integration*	M+1	14	17	16	1	**PASS**	**70**
9.	*Level 5: Customer Interface*	M	5	5	4	1	**FAIL**	**74**
		Total Skor	**55**	**78**	**74**	**4**		

Table 8 shows that the maturity of radio frequency spectrum licensing services in the service portfolio management process stops at level 4.5 external integration. The score with pass status amounted to 70 points and the total score achieved amounted to 74 points with a difference of 4 points to pass perfectly. This achievement falls into the Average Comply category.

Table 9. Maturity of IT services: Service Level Management

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+1	3	4	4	0	**PASS**	**8**
3.	*Level 2: Process Capability*	M+1	13	16	16	0	**PASS**	**24**
4.	*Level 2.5: Internal Integration*	M+1	3	4	4	0	**PASS**	**28**
5.	*Level 3: Products*	M+1	3	4	4	0	**PASS**	**32**
6.	*Level 3.5: Quality Control*	M+1	5	6	6	0	**PASS**	**38**
7.	*Level 4: Management Information*	M+1	6	7	7	0	**FAIL**	**45**
8.	*Level 4.5: External Integration*	M+1	3	4	2	2	**FAIL**	**47**
9.	*Level 5: Customer Interface*	M	5	5	5	0	**PASS**	**52**
		Total Skor	**44**	**54**	**52**	**2**		

Table 9 shows that the maturity of radio frequency spectrum licensing services in the service level management process stops at level 3.5 quality control. The acquisition of scores with pass status amounted to 38 points and the total score achieved amounted to 52 points with a difference of 2 points to pass perfectly. This achievement falls into the Standard Comply category.

Table 10. Maturity of IT services: Availability Management

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+1	3	4	4	0	**PASS**	**8**
3.	*Level 2: Process Capability*	M+1	11	13	13	0	**PASS**	**21**
4.	*Level 2.5: Internal Integration*	M+1	4	6	6	0	**PASS**	**27**
5.	*Level 3: Products*	M+1	3	4	4	0	**PASS**	**31**
6.	*Level 3.5: Quality Control*	M+1	5	6	5	1	**PASS**	**36**
7.	*Level 4: Management Information*	M+2	8	10	10	0	**PASS**	**46**
8.	*Level 4.5: External Integration*	M+2	22	25	23	2	**PASS**	**69**
9.	*Level 5: Customer Interface*	M	5	5	4	1	**FAIL**	**73**
		Total Skor	**64**	**77**	**73**	**4**		

Table 10 shows that the maturity of radio frequency spectrum licensing services in the availability management process stops at level 4.5 external integration. The score with pass status amounted to 69 points and the total score achieved amounted to 73 points with a difference of 4 points to pass perfectly. This achievement falls into the Average Comply category.

Table 11. Maturity of IT services: Knowledge Management

No.	Level	Syarat Lulus	Minimal Lulus	Maksimal Lulus	Pencapaian Skor	Selisih Skor	Status	Skor Kumulatif
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+1	4	6	6	0	**PASS**	**10**
3.	*Level 2: Process Capability*	M+2	14	17	16	1	**PASS**	**26**
4.	*Level 2.5: Internal Integration*	M+1	4	6	6	0	**PASS**	**32**
5.	*Level 3: Products*	M+1	4	6	4	2	**PASS**	**36**
6.	*Level 3.5: Quality Control*	M+1	5	6	5	1	**PASS**	**41**
7.	*Level 4: Management Information*	M+2	12	15	11	4	**FAIL**	**52**
8.	*Level 4.5: External Integration*	M+2	11	13	10	3	**FAIL**	**62**
9.	*Level 5: Customer Interface*	M	5	5	4	1	**FAIL**	**66**
		Total Skor	**62**	**78**	**66**	**12**		

Table 11 shows that the maturity of radio frequency spectrum licensing services in the knowledge management process stops at level 3.5 quality control. The score with pass status amounted to 41 points and the total score achieved amounted to 66 points with a difference of 12 points to pass perfectly. This achievement falls into the Standard Comply category.

Table 12. Maturity of IT services: Change Management

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+1	3	4	4	0	**PASS**	**8**
3.	*Level 2: Process Capability*	M+2	14	17	17	0	**PASS**	**25**
4.	*Level 2.5: Internal Integration*	M+1	7	9	9	0	**PASS**	**34**
5.	*Level 3: Products*	M+1	5	6	5	1	**PASS**	**39**
6.	*Level 3.5: Quality Control*	M+1	5	6	6	0	**PASS**	**45**
7.	*Level 4: Management Information*	M+2	11	15	14	1	**PASS**	**59**
8.	*Level 4.5: External Integration*	M+2	62	71	67	4	**PASS**	**126**
9.	*Level 5: Customer Interface*	M	5	5	4	1	**FAIL**	**130**
		Total Skor	**115**	**137**	**130**	**7**		

Table 12 shows that the maturity of radio frequency spectrum licensing services in the change management process stops at level 4.5 external integration. The score with pass status amounted to 126 points and the total score achieved amounted to 130 points with a difference of 7 points to pass perfectly. This achievement falls into the Average Comply category.

Table 13. Maturity of IT services: Service Validation and Testing

No.	Level	Syarat Lulus	Minimal Lulus	Maksimal Lulus	Pencapaian Skor	Selisih Skor	Status	Skor Kumulatif
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+1	3	5	4	1	**PASS**	**8**
3.	*Level 2: Process Capability*	M+1	9	12	12	0	**PASS**	**20**
4.	*Level 2.5: Internal Integration*	M+1	4	6	6	0	**PASS**	**26**
5.	*Level 3: Products*	M+1	3	4	4	0	**PASS**	**30**
6.	*Level 3.5: Quality Control*	M+1	5	6	6	0	**PASS**	**36**
7.	*Level 4: Management Information*	M+1	7	11	8	3	**PASS**	**44**
8.	*Level 4.5: External Integration*	M+2	14	21	17	4	**PASS**	**61**
9.	*Level 5: Customer Interface*	M	5	5	4	1	**FAIL**	**65**
		Total Skor	**53**	**74**	**65**	**9**		

Table 13 shows that the maturity of radio frequency spectrum licensing services in the service validation and testing results process stops at level 4.5 external integration. The score with a pass

status amounted to 61 points and the total score achieved amounted to 65 points with a difference of 9 points to pass perfectly. This achievement falls into the Average Comply category.

Table 14. Maturity of IT services: Service Desk

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+2	5	7	6	1	**PASS**	**10**
3.	*Level 2: Process Capability*	M+1	21	25	22	3	**PASS**	**32**
4.	*Level 2.5: Internal Integration*	M+1	4	6	6	0	**PASS**	**38**
5.	*Level 3: Products*	M+1	3	4	2	2	**FAIL**	**40**
6.	*Level 3.5: Quality Control*	M+1	5	6	2	4	**FAIL**	**42**
7.	*Level 4: Management Information*	M+1	7	9	1	8	**FAIL**	**43**
8.	*Level 4.5: External Integration*	M+1	7	9	0	9	**FAIL**	**43**
9.	*Level 5: Customer Interface*	M	5	5	5	0	**PASS**	**48**
		Total Skor	**60**	**75**	**48**	**27**		

Table 14 shows that the maturity of radio frequency spectrum licensing services in the service desk function stops at level 2.5 internal integration. The score with pass status amounted to 38 points and the total score achieved amounted to 48 points with a difference of 27 points to pass perfectly. This achievement falls into the Not Comply category.

Table 15. Maturity of IT services: Incident Management

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	3	4	4	0	**PASS**	**4**
2.	*Level 1.5: Management Intent*	M+1	5	6	3	3	**FAIL**	**7**
3.	*Level 2: Process Capability*	M+1	25	28	0	28	**FAIL**	**7**
4.	*Level 2.5: Internal Integration*	M+1	3	4	0	4	**FAIL**	**7**
5.	*Level 3: Products*	M+1	7	8	0	8	**FAIL**	**7**
6.	*Level 3.5: Quality Control*	M+1	9	10	0	10	**FAIL**	**7**
7.	*Level 4: Management Information*	M+2	5	6	0	6	**FAIL**	**7**
8.	*Level 4.5: External Integration*	M+2	11	13	1	12	**FAIL**	**8**
9.	*Level 5: Customer Interface*	M	5	5	4	1	**FAIL**	**12**
		Total Skor	**73**	**84**	**12**	**72**		

Table 15 shows that the maturity of radio frequency spectrum licensing services in the incident management process stops at level 1 pre-requisites. The score with pass status amounted to 4 points and the total score achieved amounted to 12 points with a difference of 72 points to pass perfectly. This achievement falls into the Not Comply category.

Table 16. Maturity of IT services: Problem Management

No.	*Level*	Syarat Lulus	*Minimal Lulus*	Maksimal Lulus	Pencapaian Skor	Selisih Skor	*Status*	*Skor Kumulatif*
1.	*Level 1: Pre-requisites*	M+1	4	6	0	6	**FAIL**	**0**
2.	*Level 1.5: Management Intent*	M+2	5	7	1	6	**FAIL**	**1**
3.	*Level 2: Process Capability*	M+2	14	17	0	17	**FAIL**	**1**
4.	*Level 2.5: Internal Integration*	M+2	8	10	0	10	**FAIL**	**1**
5.	*Level 3: Products*	M+1	4	5	0	5	**FAIL**	**1**
6.	*Level 3.5: Quality Control*	M+1	5	6	0	6	**FAIL**	**1**
7.	*Level 4: Management Information*	M+1	5	6	0	6	**FAIL**	**1**
8.	*Level 4.5: External Integration*	M+4	10	15	0	15	**FAIL**	**1**
9.	*Level 5: Customer Interface*	M	5	5	4	1	**FAIL**	**5**
		Total Skor	**60**	**77**	**5**	**72**		

Table 16 shows that the maturity of radio frequency spectrum licensing services at all levels of the problem management process has a FAIL status. The acquisition of scores with a pass status amounted to 0 points and the total score achieved amounted to 5 points with a difference of 72 points for a perfect pass. This achievement falls into the Not Comply category.

From the results of the maturity level measurement, it can be seen that the results are as follows:

Table 17. Maturity Level Measurement Results

Tingkat layanan	Proses IT-IL	*Maturity Level*
Service Strategy	*Financial Management*	4,5
	Service Portfolio Management	4,5
Service Design	*Service Level Management*	3,5
	Availability Management	4,5
Service Transition	*Knowledge Management*	3,5
	Change Management	4,5
	Service Validation and Testing	4,5
Service Operation	*Service Desk*	2,5
	Incident Management	1
	Problem Management	0
AVERAGE		**3,3**

Table 17 shows that based on the measurement of each process and function previously assessed, the average maturity level of radio frequency licensing services is at 3.3, which is equivalent to level 3. Defined is a procedure or function that has been set according to standards, delivered, and recorded through training activities.

Based on the interview with the head of Balmon Palembang, it was revealed that the future hope in the near future is to achieve the target of increasing the level at the point of level 4 Managed.

The next stage is gap analysis, which is a condition identified after obtaining the level of maturity and achievement expectations from management. The goal of this gap analysis process is to identify differences between the current state and management expectations, and turn these differences into opportunities for improvement.

Table 18. Gap Analysis

Process/Function	*Maturity Level*	*Target*	*GAP Analysis*
Financial Management	4	4	0
Service Portfolio Management	4	4	0
Service Level Management	4	4	0
Availability Management	4	4	0
Knowledge Management	4	4	0
Change Management	4	4	0
Service Validation and Testing	4	4	0
Service Desk	2	4	2
Incident Management	1	4	3
Problem Management	0	4	4

Once the gaps are defined, evaluation and identification of improvement opportunities are conducted, and best practices are sought that can be used to address the differences. The approach that needs to be taken is to use an understanding of the current condition, which is based on the assessment aspects, and compare it with the expectations desired by management. The solution approach is carried out by referring to the ITIL version 3 framework as a foundation for overcoming existing differences and designing improvement strategies on certain aspects that require improvement. By applying the principles of ITIL V3, specific steps can be identified to improve ineffective or inefficient processes. For example, by using the Incident Management concept from ITIL V3, organizations can improve incident handling processes that are more responsive and structured. Likewise with Problem Management, where by applying the principles of ITIL V3, organizations can identify the root causes of problems that often occur and implement preventive solutions so that these problems do not recur in the future. Thus, the application of ITIL V3 helps organizations identify, evaluate, and improve processes related to the management of radio frequency spectrum licensing services.

4. Conclusion

Based on the earlier conversation, it's evident that the radio frequency spectrum services provided by the Balai Monitor Spektrum Radio Frequency Class I Palembang have integrated ITIL version 3 methodologies. These include financial management, service portfolio management, service level

management, availability management, knowledge management, change management, and service validation and testing. According to the assessment of process maturity, these processes have attained level 4, which is Managed, meeting the Class I Palembang Radio Frequency Spectrum Monitor Center leader's expectations. This indicates that the organization has taken significant steps in improving the quality and effectiveness of their services in accordance with ITIL version 3 standards. Thus, this reflects their commitment to ensuring that the radio frequency spectrum services they provide are at a high standard and meet user needs well.

However, on average, from all the processes measured, the maturity level of radio frequency spectrum services is at level 3 Defined. This is influenced by the level of the service desk function at level 2 Repeatable, incident management process at level 1 Initial and problem management process at level 0 Non-existent. For this reason, improvements are recommended for functions and processes that are still below expectations.

The recommendations for the service desk function include improving procedures, individual metrics and increasing the capacity of human resources. Suggestions for enhancing incident management and problem management procedures are essential actions aimed at enhancing the efficiency of radio frequency spectrum licensing service management at the Radio Frequency Spectrum Monitoring Center Class I Palembang. These steps include the development of more efficient incident and problem handling procedures and the implementation of stricter oversight of these processes. As such, these efforts aim to ensure that radio frequency spectrum licensing services can be run more efficiently and responsively to user needs. This will enhance the caliber and accessibility of these services while mitigating the adverse effects of potential incidents and issues.

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