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Research Paper

Analysis Quality of Valins New Service Installation To Improve Valins Accuracy

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ABSTRACT: *In response to the continuously evolving telecommunications industry landscape, PT Telkom Indonesia consistently strives to ensure the availability of telecommunications infrastructure to deliver IndiHome services to customers. One crucial issue in guaranteeing this infrastructure availability is the validity of port availability at the Optical Distribution Point (ODP), both physically and within the system, which can be verified through VALINS activities. The accuracy of VALINS is fundamental as a basic support infrastructure to enhance the success of new service installations, increase prospective customer satisfaction, and improve service delivery quality, ultimately aiming to produce up-to-date data in the system. The study conducted at PT Telkom Regional III West Java employs the DMAIC (Define, Measure, Analyze, Improve & Control) approach and gathers insights from forum group discussions (FGD) held together with data validation practitioners from Telkom Indonesia to explore the implementation of quality management in VALINS activities, its impact on the success of new service installations, and subsequently identify the root causes through Current Reality Tree analysis. This led to the selection of several strategies to enhance VALINS accuracy through the implementation of the Analytical Hierarchy Process (AHP) using the SuperDecisions SDv3_2_winHD.exe tool. The findings reveal that improving standard operating procedures, revising the cooperation contract between PT Telkom and PT Telkom Access, forming a special team to monitor the effectiveness of existing SOPs, conducting training to shift the mindset from reactive to preventive, and massive socialization about the importance of VALINS as a core PSB activity are comprehensive solutions that should be implemented. However, a primary strategy must still be chosen. Through in-depth analysis, this study aims to uncover the intricacies of the VALINS process to improve VALINS accuracy or the quality of ODP infrastructure data and decision-making processes in the context of data quality. The research results offer valuable insights that can serve as a guide for data validation practitioners at Telkom to adopt a preventive perspective in managing infrastructure data.*

KEYWORDS: *Valins, Quality, AHP, Valins Accuracy, Data Validation, Infrastructure, Optical Distribution Point.*

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I. INTRODUCTION

The intense business competition in the era of globalization demands the need for effective quality management, which becomes a crucial requirement for the sustainability of companies. Awareness of the importance of good quality management in various business sectors is essential to be implemented. The high demands for service quality across various business sectors force organizational management to assess the extent to which service quality can be provided to customers. The enactment of Public Service Law No. 25 of 2009 demands the fulfillment of quality in service provision [1] .

In the provision of Telecommunication services at PT Telekomunikasi Indonesia Tbk, the validation process of Fiber to The Home infrastructure and service data plays a crucial role in ensuring data quality. The focus of this research is on the IndiHome product as one of Telkom's flagship connectivity products. In the Fiber to The Home (FTTH) network topology, IndiHome services are delivered to customers' homes through Optical Distribution Point (ODP) devices. The ODP is installed on Telkom poles, typically in the form of a box containing production equipment known as ports, consisting of 1 or 2 panels, where each panel comprises 8 ports [2]. A port unit can be considered the same as a customer, meaning that if there is 1 panel in 1 ODP, it means there are 8 customers that can be served. The data validation process on the Optical Distribution Point

(ODP) conducted by field technicians is known as the VALINS activity. The tools used include the VALINS Bot and unconfigured ONT. The indicator corresponding to the Standard Operating Procedure is referred to as VALINS ACCURACY. VALINS ACCURACY signifies the alignment of the data stored in the database through VALINS activities compared to the real conditions in the field, which can be substantiated with required photo evidence. The ODP construction process starts with macro or micro-demand analysis conducted by the marketing unit, and its execution in each region is carried out by the Regional Access Management unit.

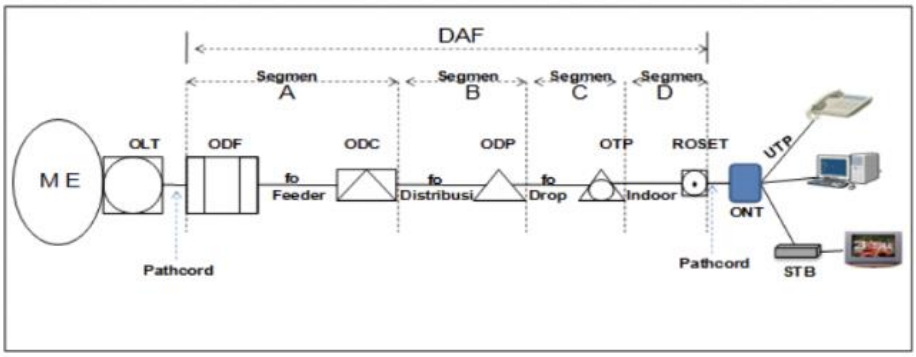

Diagram 1: Network topology fiber to the home

The previous research reference has implemented Current Reality Tree "Penerapan House of Risk dan Current Reality Tree untuk menentukan prioritas aksi mitigasi resiko" by Muhammad Kharis Sumitro, year 2022 in PT Sierad Produce Tbk at Slaughterhouse division. The research conduct analyzed food industry poultry based to identified risks agent that potential to distrub production process using Current reality tree. Using the Current Reality Tree method, 30 risk events and 24 risk agents were identified. Processing with House of Risk stage 1 and a Pareto diagram resulted in 12 risk agents meeting 80% cumulative, with the risk agent "using uniformity +/- 10%" in the red zone. Discussions with experts led to 13 appropriate mitigation actions, followed by House of Risk stage 2. Based on House of Risk stage 2, the risk agent "using uniformity +/- 10%" can be mitigated to the yellow zone, and the mitigation action "Implementing a punishment and reward system to motivate workers" is the highest priority [3].

Another previous research is “Optimizing Drilling cost through the application of hydraulic workover unit to drill new wells in Andalan delta" by Raden Ryan Aditya Surya Wijaya year 2022. This research analyzed What factors contribute to the high costs of oil well drilling in the TN field, particularly in shallow TN fields? Root cause analysis using the Current Reality Tree and alternative solutions using the AHP method. Alternative solutions were identified based on research and improvisation from project management implementation and drilling innovations using appropriate rig equipment designs. This research resulted in the chosen alternative solution of drilling using a Hydraulic Workover Unit (HWU) [11].

Another research references have implemented Six Sigma in the IndiHome service by Abby Yazid Bustommy, Dana Santoso Saroso & Sawarni Hasibuan year 2021 in the Mekar Jaya Industrial Area, Tangerang. The research conducted analyzed the quality of IndiHome service using the Six Sigma 5-phase (DMAIC) through the analysis of the number of disruptions from total customers in Mekarjaya every month. Current situation informed that Average monthly Customer complaint about IndiHome Service since des 2018 - nov 2019 is 14% and total cost of poor quality is 71.000.000 IDR or monthly average 7.888.889, - IDR. The research using secondary data from internal company, conduct investigate a direct observation, conduct mapping SIPOC (Supplier, Input, Process, Output, Customer). The analysis is conduct through measure Critical to Quality (CTQ) analysis, failure mode and Effect Analysis (FMEA), Poka Yoke analysis as preventive measure in quality control, Pareto chart analysis, conduct cause effect diagram, Analysis Cost of poor Quality (COP) repair IndiHome problems. The next step is to conduct measurement of Defect per opportunity (DPO), Defect per Million Opportunity (DPMO), measuring of the proportion of IndiHome defect and measuring of IndiHome complaint. The research give recommendation through RPN (risk priority number) calculation are priority for corrective action that is re-install Telkom's pole the height of the passing container, replacement distribution cable capacity to 12 or 24 cores or repair the connection by installing the joint closure to reduce cable connection dan eliminating or replacing ODP and using some tools to remind technician to close ODP after conduct repairing [4].

Another research reference also implemented Six Sigma 5-phase (DMAIC) in the IndiHome service by I Made Sondra & Dely Indah sari, year 2022 in Batam [5]. The research conducted analyzed the causes of new service installation (PSB) failures through the analysis of fiber optic disruptions that occurred for the total new service installation every month. Current situations give information that the sigma level is 1,306 or condition

level 2 sigma, the research using secondary data, conduct Investigate and direct observation, the analysis is conducted by performing measurement through pareto diagram analysis based on interview result, count control limit analysis, P Chart, defect analysis dan count level sigma & defect per million opportunities (DPMO). The research recommendation is to increase six sigma Level from 1,306 or level 2 sigma become 6 Sigma level to decrease Fiber optic disruption through PSB produce, give recommendation to conduct training at least every six months to upgrade employee skill [5].

II. THEOROTICAL FRAMEWORK

II.1 DMAIC

DMAIC (Define, Measure, Analyze, Improve, Control) is a process for continuous improvement towards Six Sigma targets, conducted systematically based on knowledge and facts. The DMAIC process eliminates unproductive steps to focus on new measurements and the implementation of technologies aimed at improving product or service quality and reducing defects to enhance customer satisfaction. In this context, DMAIC is used for product manufacturing or service delivery [6].

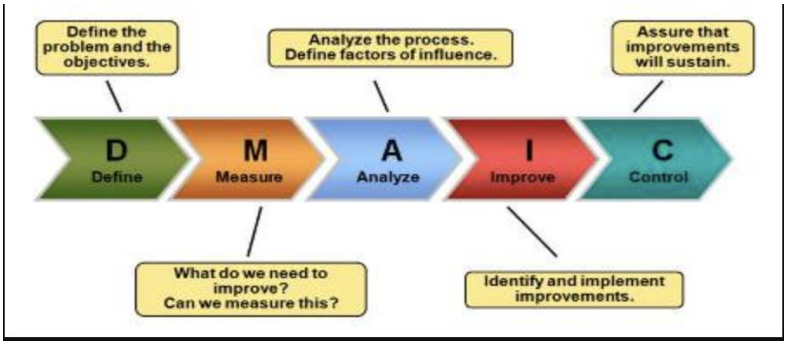

Figure 1: DMAIC

II.2 THEORY OF CONSTRAINS

Theory of Constraints (TOC) is a management philosophy developed by Dr. Eliyahu M. Goldratt also stated that the optimal performance of a system can only be achieved if the existing constraints are managed optimally. The TOC thinking process is an approach that enables us to create and implement changes systematically to achieve a goal. These changes are guided by three fundamental questions: "What to change?", "To what to change?", and "How to cause the change?". The TOC application tools, consisting of five tree diagrams, can answer these questions: the Current Reality Tree, Evaporating Cloud, Future Reality Tree, Prerequisite Tree, and Transition Tree [7].

II.3 ANALYTICAL HIERARCHY PROCESS

Analytical Hierarchy Process (AHP) It is a decision support model developed by Thomas L. Saaty. This model simplifies complex multi-factor or multi-criteria problems by breaking them down into a hierarchy. According to Saaty (1993), a hierarchy is a multi-level representation of a complex problem, where the first level is the goal, followed by levels of factors, criteria, sub-criteria, and finally the alternatives. By using a hierarchy, a complex problem can be decomposed into its constituent groups, which are then organized into a hierarchical structure. This makes the problem more structured and systematic [12].

According to Saaty, there are three main principles in problem-solving within AHP: Decomposition, Comparative Judgment, and Logical Consistency. The AHP procedure generally includes the following steps [13]

- Problem Decomposition: This step involves systematically breaking down a defined goal into a structured hierarchy of elements, making it easier to achieve the goal rationally. Essentially, a comprehensive goal is divided into its constituent components.
- Assessment/Weighting of Elements: After the decomposition process is complete and the hierarchy is well-structured, pairwise comparison assessments (weighting) are performed for each level of the hierarchy based on their relative importance.
- Matrix Formation and Consistency Testing: Once the weighting or questionnaire process is finished, the next step is to form a pairwise comparison matrix to normalize the weights of the importance levels for each element within its hierarchy. This analysis can be performed manually or using computer programs like Expert Choice.

- Priority Setting within Each Hierarchy: For each criterion and alternative, pairwise comparisons are made. The relative comparison values are processed to rank the alternatives. Both qualitative and quantitative criteria are compared based on the established assessments to determine weights and priorities. These weights or priorities are calculated through matrix manipulation or solving mathematical equations.
- Synthesis of Priorities: This involves multiplying the local priority by the priority of the related criterion at the higher level and adding it to each element in the affected level. The result is a combined, or global, priority, which is used to assign local priority weights to the elements at the lowest level of the hierarchy according to their criteria.
- Decision Making: This final step involves selecting the best alternative based on the criteria established throughout the process.

III. RESEARCH METHODOLOGY

III.1 RESEARCH DESIGN

This research utilizes secondary data documentation from the company's internal dashboard in the infrastructure unit and draws from several previous research on IndiHome services in various cities in Indonesia. The data collection tool for this research includes institutional data and internally owned company data, specifically performance data infrastructure, and factual data from actual field conditions, ensuring that the data presented in this case study can be deemed valid.

Data collection also involves several expert practitioners in the field of VALINS ACCURACY, especially concerning alternative solutions that can be implemented. The Focus Group Discussion (FGD) method is implemented to gather alternative solutions, with questions posed as follows:

1. Several environments influencing the quality of VALINS ACCURACY at Telkom currently include the work supervision model from an organizational perspective, unit price work contract (KHS), internal technician management by Telkom Akses, and the tools used for VALINS. To what extent do these environments affect the quality of VALINS ACCURACY?
2. Given the current conditions, what could the regional do to improve the quality of VALINS ACCURACY with the condition that it has the most significant impact on performance, is the easiest to implement, and supports cost leadership?

Academics have defined validity because of the reliability of qualitative research. Validity and reliability reinforce that triangulation has enhanced the credibility of findings [8]. This is evident when researchers apply triangulation procedures at several stages as follows: (i) during the data collection process (through observation to the field in the company, reviewing company documents, performance from the company's internal dashboard, direct field observations, and through company forum group discussions). Therefore, researchers are aware that the main strength of case study data collection is the opportunity to use many sources of evidence. This is demonstrated when researchers have the chance to combine various sources of evidence in developing convergent line inquiry techniques.

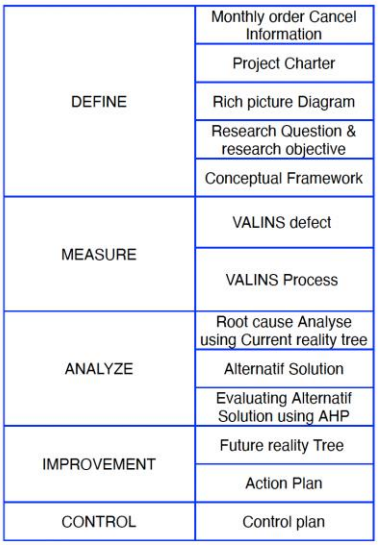

Figure 2: Research framework

III.2 DATA COLLECTION METHOD

Data collection was collected from the sources of their Internal dashboard, performance data, researcher experience in data validation performance unit and several previous research in Telkom that is relevant and valid to the research purpose. Using tool Super decision SDv3_2_winHD.exe to compute result from forum group discussion to explore improvement alternatives.

The data processing on this research shall be as follow:

1. Identify the current situation regarding the research object, such as complaints from other infrastructure units about the failure of new service installation (PSB) due to full ODP. Review the quality of VALINS results from New Installation data each month, providing background information on the problem.
2. Define the business scope such as the determination of performance, context business and quality management, business process mapping, and collected performance data that's relevant to the improvement program to highlight the improvement area that is found.
3. Suggest recommendations and other improvements to control & support the implementation of the improvements that are planned.

The data for this research was obtained from:

1. Telecommunication Company documents that describe the illustration of quality management strategic implementations.
2. Telecommunication Company documents related to the company's performance.
3. Other sources and references from mass media, research institutions, various literature and web sites on the internet that are related with the research problem would also be considered as references as research problem analysis.

III.3 DATA ANALYSIS METHOD

Data is gotten from the company's performance reports and thus will proceed onto the discussion about the findings. This data was collected from a forum group discussion with an expert practitioner so there would be any questions to discuss. The data analysis will be conducted which finds the problem of the quality management in the company's VALINS performance. It will also conduct the cause and effects analysis in the qualitative technique of data analysis. Compared to previous research methods, the advantage of the analytical method used by the researcher lies in the direct verification in the field regarding the functional testing of the BOT VALINS tools and the behaviors of technicians during VALINS activities.

IV. RESULT AND DISCUSSION

IV.1 DATA ANALYSIS

Data processing and collection are conducted at PT Telekomunikasi Indonesia Tbk in the Regional Access Management (RAM) unit under the Data Validation & Inventory Management sub-unit. The required data includes the company's organizational structure and an overview of the VALINS process.

Some data that can be used to assess the urgency of resolving the VALINS ACCURACY issue include measuring defect data from VALINS results as shown in the following table:

Month	Valins NOK	Valins OK	Total PSB (Valins)	% NOK
Juli 2023	3.104	3.793	6.897	45,01%
Agustus 2023	3.078	7.434	10.512	29,28%
September 2023	1.796	9.337	11.133	16,13%
Oktober 2023	974	7.163	10.063	9,68%
Nopember 2023	1781	8524	10.305	17,28%
Desember 2023	1104	11.547	12.651	8,73%
Januari 2024	1783	10.749	12.532	14,23%
Februari 2024	995	11.946	12.941	7,69%
	14.615	**70.493**	**87.034**	**20,73%**

Figure 3: Valins Defect

From Figure 3, it is known that the measurement step begins with calculating the total number of PSBs (Valins) each month for eight (8) months, which amounts to 87,034 customers. Furthermore, from this total PSBs (Valins), it is known that there are 14,615 customers whose Valins results do not comply with the standard operational procedure, representing 20.73%.

Based on process of installing new services (PSB), there is a VALINS activity within it that can be explained in more detail through the following diagram:

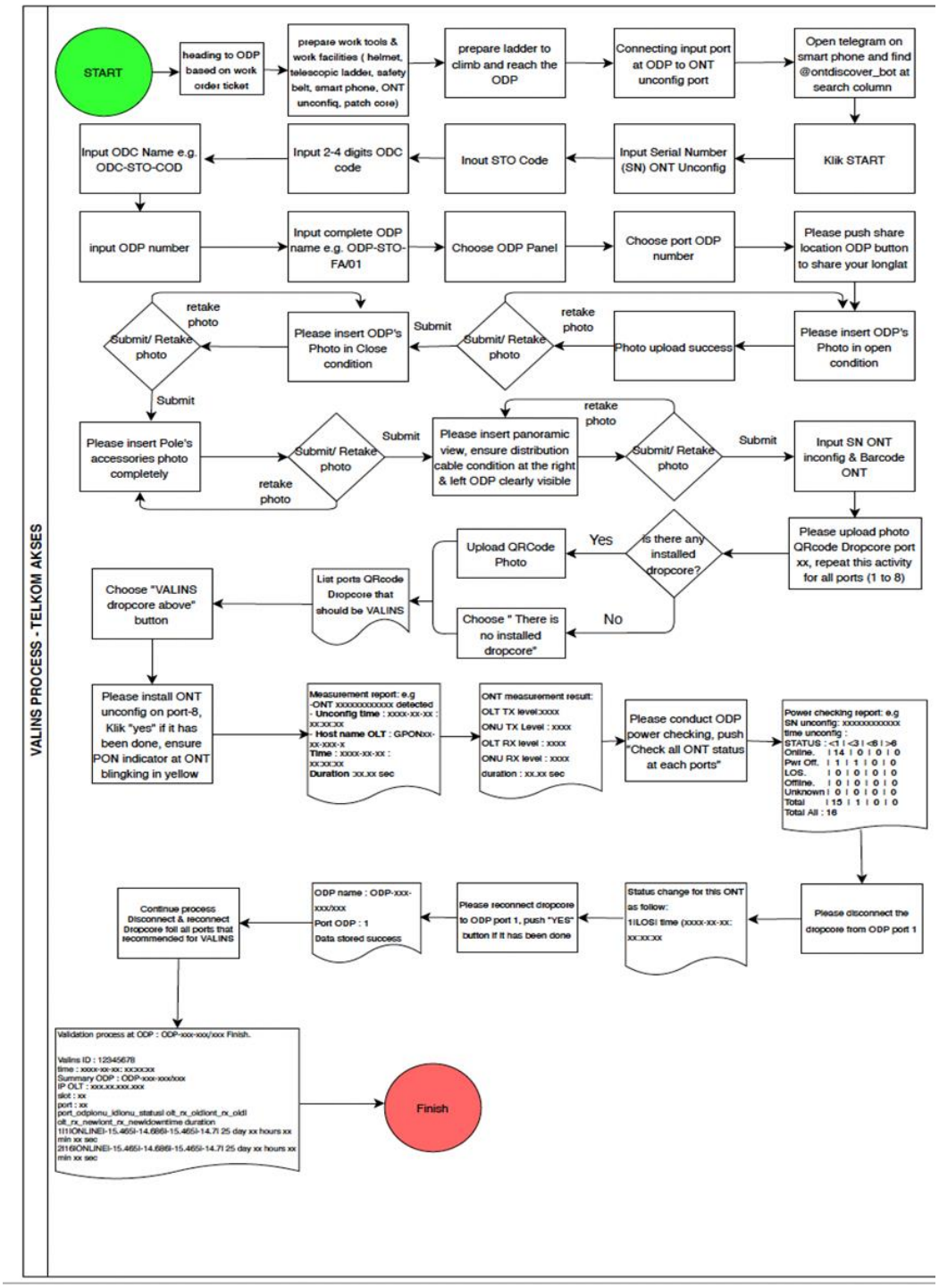

Diagram 2: Valins process detail

Based on Diagram 2, it is known that the VALINS activity is carried out by technicians at the ODP recommended by the system during the installation of new services (PSB). The work tools include a helmet used to support worker safety, a telescopic ladder for climbing the ODP, a one-click cleaner, which is a drop core cleaning fluid applied to the drop core jack when removed, aiming to maintain the cleanliness of the drop core jack to reduce attenuation values. Furthermore, the Telegram bot is an application on the technician's smartphone used for the VALINS process, where the technician's Telegram account must be registered in the

application to access it, while the ONT Unconfigure is a tool used to help the Telegram bot detect the status of each ODP port.

The general outline of the work process is as follows: the technician must input the technical data of the ODP to be VALINS, then share the location of the ODP to be VALINS and input photos of the ODP in both open and closed states. Photos of ODP pole accessories and panoramic photos showing the distribution cable on the right and left sides of the ODP should also be taken clearly. Next is registering the QR Code drop core of all ports, aiming to list which ports will be VALINS. Then, the technician connects the ONT Unconfigure to the ODP port on port 8 or an empty port to determine the GPON port slot for that ODP by performing power checking on all ports first and ensuring that the PON indicator light on the ONT is blinking yellow. After that, proceed with the VALINS process by removing the drop core from the listed port for VALINS, and the system will give a LOS notification to indicate the presence of a drop core in that port. Then reconnect by returning the drop core to its original port and save the data. Repeat this process for all ports until completion [9].

To identify root cause, the important step to do is to conduct a root cause analysis using the current reality tree (CRT). The current reality tree is a visual representation of three components - Undesirable Effects (UDEs) or intermediate effects, and root causes. The CRT is constructed from top to bottom, starting from the UDEs and ending with the root causes [10]. Starting with the UDEs speeds up the analysis of what's wrong with the system. Here is the Current Reality Tree proposed:

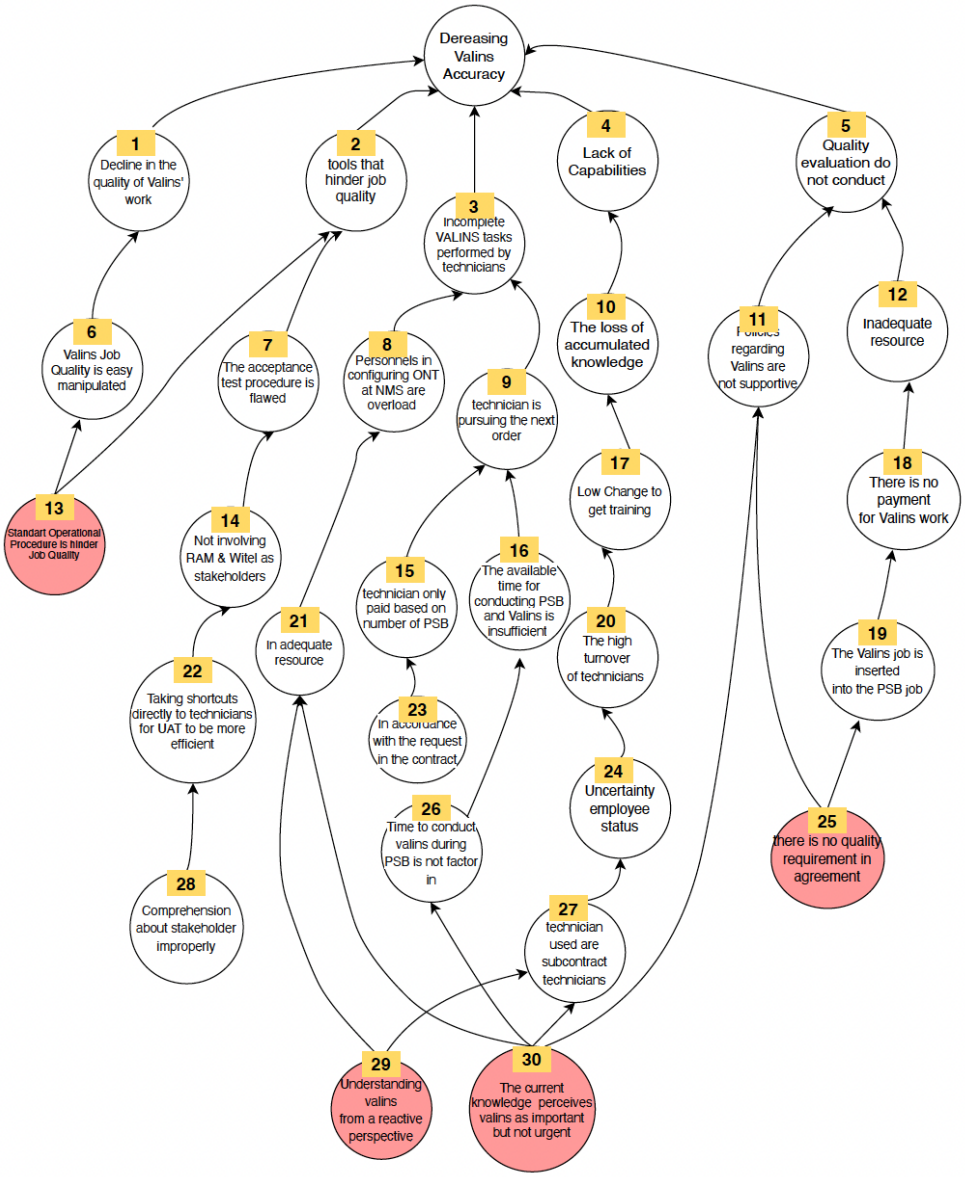

Diagram 3: Current Reality Tree (CRT)

Based on Diagram 3, there are 26 undesirable effects identified as causing of Decreasing VALINS ACCURACY and found 4 root cause, it would be explain as follow:
The decrease in Valins Accuracy is caused by UDE 1, where the occurrence of UDE 1 is caused by UDE 6, which in turn is caused by UDE 13. Furthermore, the decrease in Valins Accuracy is also caused by UDE 2 and UDE 13, where UDE 2 is caused by UDE 7, which in turn is caused by UDE 14. UDE 14 is caused by UDE 22, which is caused by UDE 28.
Additionally, the decrease in Valins Accuracy is caused by UDE 3, where UDE 3 is caused by UDE 8 and UDE 9. UDE 8 is caused by UDE 21, which is caused by UDE 29 and UDE 30. Returning to UDE 9, it is caused by UDE 15 and 16, where UDE 15 is caused by UDE 23. Returning to UDE 16, it is caused by UDE 26, which is caused by UDE 30.
Moreover, the decrease in Valins Accuracy also occurs due to UDE 4, where UDE 4 is caused by UDE 10, which is caused by UDE 17. UDE 17 is caused by UDE 20, which is caused by UDE 24. UDE 24 is caused by UDE 27, which is caused by UDE 30.
Additionally, the decrease in Valins Accuracy also occurs due to UDE 5, where UDE 5 is caused by UDE 11 and UDE 12. UDE 11 is caused by UDE 25 and UDE 30. Returning to UDE 12, it is caused by UDE 18, which is caused by UDE 19, which is caused by UDE 25.

Thus, from the Current Reality Tree above, four root problems were identified:
1. Standard Operational Procedure is hinder Job Quality
2. Understanding Valins from reactive perspective
3. The current knowledge perceives VALINS as important but not urgent
4. There is no Quality requirement in agreement

Out of the four root causes identified, alternative solutions are required, accompanied by criteria supporting these solutions.

IV.2 THE ANALYCTICAL HIERARCHY PROCESS

From the various alternative solutions mentioned above, an evaluation is needed to select the best alternative that can contribute the most to improving VALINS ACCURACY.
The Analytical Hierarchy Process (AHP) is a decision-making method by ranking decision alternatives and selecting the best decision based on predetermined criteria. According to Carlos (2018), the Analytic Hierarchy Process (AHP) is a multi-criteria decision-making supported by a recognized and accepted methodology that theoretically provides different answers in decision-making problems and ranks alternative solutions. [12] explain that the Analytical Hierarchy Process (AHP) method is multi-criteria because it uses many criteria in prioritizing a decision-support system. In addition to its multi-criteria nature, the AHP method is also based on a logical and structured process because its prioritization is carried out using logical and structured procedures.

The criteria considered for determining the best solution to enhance VALINS ACCURACY include three criteria: providing the most significant positive impact on VALINS ACCURACY performance, supporting Cost leadership, and being the most easily executable. There are 5 alternative solutions obtained, namely revising the Standard Operational Procedure (SOP) through risk mitigation of the current running Procedure, forming a special team responsible for monitoring and evaluating the effectiveness of SOP implementation, conducting specific training and workshops to enhance understanding of the importance of valins from a proactive perspective, massive socialization about VALINS as the core activity of new service installation, revising the provisioning cooperation agreement between PT Telkom Indonesia and Telkom Akses.
The criteria and alternative solutions were obtained through data collection methods based on interview results, focus group discussions (FGDs), direct observations at the ODP locations, and direct meetings with VALINS practitioners and Telkom Akses technicians. The steps in using AHP are as follows:

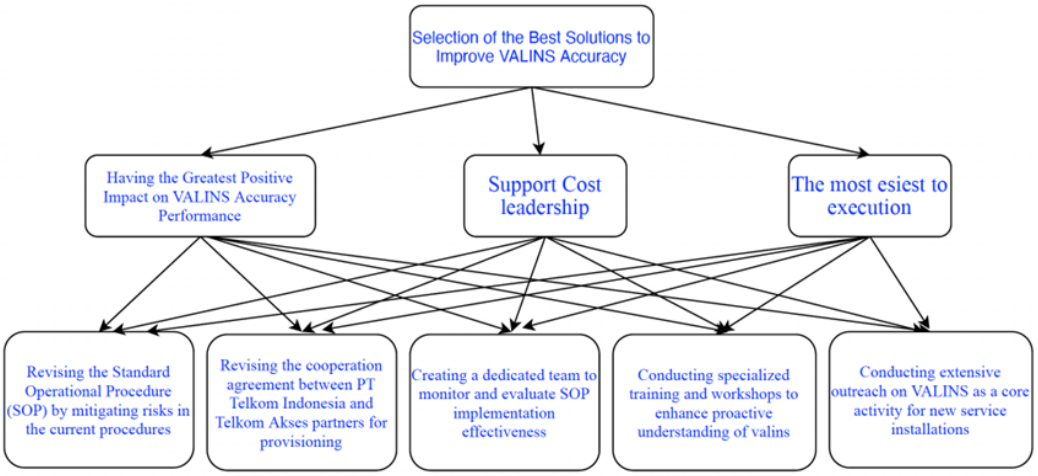

Diagram 2: Hierarchy tree selection best solution to improve VALINS accuracy

Goal	Description
Selection of the Best Solutions to Improve VALINS Accuracy	The goal is to select the best solutions that will enhance the accuracy of VALINS. This involves identifying and implementing measures that will improve the precision and reliability of data recorded within the VALINS system.
Criterias	
Having the Greatest Positive Impact on VALINS Accuracy Performance	This criterion assesses the extent to which a solution will positively influence the accuracy of VALINS data. Solutions that are expected to have a significant impact on improving data precision and reliability will be prioritized
Support Cost leadership	This criterion evaluates the cost-effectiveness of implementing a solution. Solutions that offer improved accuracy while maintaining or reducing costs will be favored, as they provide value for money and support cost leadership within the organizatio
The most esiest to execution	This criterion considers the feasibility and practicality of implementing a solution. Solutions that are easier to execute, requiring minimal resources, time, and effort, will be preferred. This ensures that the chosen solutions can be efficiently implemented without encountering significant obstacles or delays.

Figure 1: Explanation hierarchy tree selection of the best solution to improve VALINS accuracy

Table 4 is a table that explains the hierarchy tree of the goal and criteria for the selection of the best solution to improve VALINS accuracy, which will be applied through the AHP method using the Super Decision application version SDv3_2_winHD.exe

Criteria and alternatives are evaluated through pairwise comparisons using a scale from 1 to 9 [13], which is the best method for expressing opinions in various issues. This comparison scale, developed by Saaty, provides values that allow for qualitative assessment of comparisons among existing criteria and alternatives. Further information on the definition of qualitative opinions related to the Saaty comparison scale can be found in Figure 5.

Numerical ratings	Verbal judgments
1	Equally important (preferred)
3	Moderately more important
5	Strongly more important
7	Very strongly more important
9	Extremely more important
2,4,6,8	Value between two adjusting consideration values

Figure 2: Pairwise comparison

IV.3 DETERMINING PRIORITIES FOR CRITERIA

After determining the goal, criteria, and alternative solutions obtained, the next step is the evaluation process of criteria and alternative solutions to obtain the best solution. Data collection is obtained by conducting focus group discussions (FGD) with VALINS practitioners at Telkom Indonesia. The following are the results of the FGD in calculating pairwise comparison priorities on criteria.

Criterias	(C1) Having the greatest positive Impact on Valins accuracy performance	(C2) Support Cost Leadership	(C3) The Most esiest to execution
(C1) Having the greatest positive Impact on Valins accuracy performance	1,00	4,00	3,00
(C2) Support Cost Leadership	0,25	1,00	0,50
(C3) The Most esiest to execution	0,33	2,00	1,00
Total	**1,58**	**7,00**	**4,50**

Figure 3: Criteria's pairwise comparison

In determining the priority of criteria, the next step is to normalize the Eigen values in the criteria value matrix in Figure 6 by making relative comparisons and then processing them in decimal form to determine the weights of each criterion to subsequently find the priority value of the criteria.

Criterias	(C1) Having the greatest positive Impact on Valins accuracy performance	(C2) Support Cost Leadership	(C3) The Most esiest to execution	Priority (Average)
(C1) Having the greatest positive Impact on Valins accuracy performance	0,63	0,57	0,67	0,62
(C2) Support Cost Leadership	0,16	0,14	0,11	0,14
(C3) The Most esiest to execution	0,21	0,29	0,22	0,24
Total	**1,00**	**1,00**	**1,00**	**1,00**

Figure 7: Criteria's matrix value (Eigen value normalization)

IV.3.1 Consistency Test at the Criteria Level

Next, the calculation of the consistency ratio (CR) is performed on the criteria to see whether the weighting done is consistent or not. The weighting is said to be consistent if the value of the consistency ratio CR <0.1, indicating that the respondents' assessments are considered appropriate. If there is a CR value> 0.1, then what should be done is to reconsider and ensure that the respondents truly understand the questions and issues presented. Here is how to calculate the consistency ratio (CR):

IV.3.1.1 Calculating Lambda Max

λmax = Σ "Total" at Figure 7 x Priority (Average) at Figure 7

= (1,58 x 0,62) + (7 x 0,14) + (4,5 x 0,24) = 3,0255

IV.3.1.2 Calculating consistency index value (CI)

CI = (λmax - n)/(n-1), n = no of criteria

= (3,0255-3)/ (3-1) = 0,01274

IV.3.1.3 Calculating consistency ratio value (CR)

CR = CI/RI, where RI is the Random Consistency Ratio value where the value taken is determined by the number n, in this case, the number n is 3, so the RI value is 0.58.

CR = 0,01274 / 0,58 = 0,02197.

Based on the calculation above, it is known that the assessment of the criteria to achieve the Goal has a consistency ratio value of 0.02197, which means that further calculations can be carried out. The priorities of these criteria based on the calculation are as follows:

V. CALCULATING PAIRWAISE COMPARISON VALUES ON ALTERNATIVES

Next is to assess the alternatives, the steps are initiated as follows:

V.1 CALCULATING PAIRWISE COMPARISON VALUES FOR ALTERNATIVES BASED ON CRITERION-1 (HAVING THE GREATEST POSITIVE IMPACT ON VALINS ACCURACY PERFORMANCE)

To obtain the pairwise comparison values for alternatives, it has been done through a forum group discussion (FGD) with VALINS practitioners at PT Telkom Indonesia.

Based on - Having the greatest positive Impact on Valins accuracy performance	A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	A2 -Revising the cooperation agreement between PYT Telkom Indonesia and Telkom Akses partners for provisioning	A3-(Creating a dedicated team to monitor and evaluateSOP implementation effectiveness)	A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)
A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	1,00	3,00	2,00	2,00	3,00
A2 -Revising the cooperation agreement between PYT Telkom Indonesia and Telkom Akses partners for provisioning	0,33	1,00	2,00	3,00	2,00
A3 (Creating a dedicated team to monitor and evaluateSOP implementation effectiveness)	0,50	0,50	1,00	0,50	2,00
A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	0,50	0,33	2,00	1,00	2,00
A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	0,33	0,50	0,50	0,50	1,00
Total	**2,67**	**5,33**	**7,50**	**7,00**	**10,00**

Figure 4: Alternatives pairwise comparison based on criteria 1

In determining the priority of alternatives, the next step is to normalize the Eigen values in the alternative value matrix in Figure 9 by performing relative comparisons and then processing them in decimal form to determine the ranking of alternatives from all alternatives.

Based on - Having the greatest positive Impact on Valins accuracy performance	A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	A2 -Revising the cooperation agreement between PYT Telkom Indonesia and Telkom Akses partners for provisioning	A3-(Creating a dedicated team to monitor and evaluateSOP implementation effectiveness)	A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	Priority
A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	0,38	0,56	0,27	0,29	0,30	0,36
A2 -Revising the cooperation agreement between PYT Telkom Indonesia and Telkom Akses partners for provisioning	0,13	0,19	0,27	0,43	0,20	0,24
A3 (Creating a dedicated team to monitor and evaluate SOP implementation effectiveness)	0,19	0,09	0,13	0,07	0,20	0,14
A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	0,19	0,06	0,27	0,14	0,20	0,17
A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	0,13	0,09	0,07	0,07	0,10	0,09
Total	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**

Figure 5: Alternatives matrix value (Eigen value normalization) based on criteria 1

Consistency ratio (CR) calculations are performed on the alternatives to see if the weighting applied is consistent or not. The weighting is considered consistent if the consistency ratio (CR) calculation value is <0.1, indicating that respondent assessments are considered appropriate. If the CR value is >0.1, it is advisable to reconsider the judgments and ensure that respondents fully understand the questions and issues presented. Here is how to calculate the consistency ratio (CR):

V.1.1 Calculating Lambda Max :

λ max = Σ "Total" at Figure 9 x Priority (Average) at Figure 10

= (2,67 x 0,36) + (5,33 x 0,24) + (7,5 x 0,14) +(7 x 0,17) + (10 x 0,09) = 5,39

V.1.2 Calculating consistency index value (CI)

CI = (λ max - n)/(n-1), n= number of alternatives

= (5,39-5)/ (5-1) = 0,10

V.1.3 Calculating consistency ratio value (CR)

CR = CI/RI, where RI It is the Random Consistency ratio value where the value taken is determined by the number n, in this case, the number n is 5, so the RI value is 1.12

CR = 0,10 / 1,12 = 0,087.

Based on the calculation above, it is known that the assessment of alternatives based on criterion -1 (Having the greatest positive Impact on Valins accuracy performance) has a consistency ratio value of 0.087, which means further calculations can be conducted.

V.2 CALCULATING THE PAIRWISE COMPARISON VALUES FOR ALTERNATIVES BASED ON CRITERION-2 - SUPPORT COST LEADERSHIP

(C2) Support Cost Leadership	A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses	A3-(Creating a dedicated team to monitor and evaluateSOP implementation effectiveness)	A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)
A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	1,00	0,50	2,00	2,00	3,00
A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	2,00	1,00	2,00	2,00	3,00
A3 (Creating a dedicated team to monitor and evaluate SOP implementation effectiveness)	0,50	0,50	1,00	0,50	3,00
A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	0,50	0,50	2,00	1,00	2,00
A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	0,33	0,33	0,33	0,50	1,00
Total	**4,33**	**2,83**	**7,33**	**6,00**	**12,00**

Figure 6: Alternatives pairwise comparison based on criteria-2

Figure 11 presents the alternative assessment based on the criterion of Support Cost Leadership, obtained through FGDs with VALINS practitioners at PT Telkom Indonesia.

(C2) Support Cost Leadership	A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	A3-(Creating a dedicated team to monitor and evaluateSOP implementation effectiveness)	A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	Priority
A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	0,23	0,18	0,27	0,33	0,25	0,25
A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	0,46	0,35	0,27	0,33	0,25	0,33
A3 (Creating a dedicated team to monitor and evaluate SOP implementation effectiveness)	0,12	0,18	0,14	0,08	0,25	0,15
A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	0,12	0,18	0,27	0,17	0,17	0,18
A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	0,08	0,12	0,05	0,08	0,08	0,08
Total	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**

Figure 7: Alternatives matrix value (Eigen value normalization) based on criteria-2

V.2.1 Calculating Lambda Max

λmax =Σ "Total" at table 11 x Priority (Average) at Figure 12

= (4,33 x 0,25) + (2,83 x 0,33) +(7,33 x 0,15) + (6 x 0,18) +(12 x 0,08) = 5,21

V.2.2 Calculating consistency index value (CI)

CI = (λ max - n)/(n-1), n= number of alternatives

= (5,21-5)/ (5-1) = 0,05

V.2.3 Calculating consistency ratio value (CR)

CR = CI/RI, where RI is the Random Consistency ratio value, which is determined by the number n, in this case, the number n is 5, so the RI value is 1.12.
CR = 0,05 / 1,12 = 0,047.

Based on the calculation above, it is known that the evaluation of alternatives for criterion-2 (Support cost leadership) has a consistency ratio value of 0.047, which means further calculations can be carried out.

V.3 CALCULATING THE PAIRWISE COMPARISON VALUES FOR ALTERNATIVES BASED ON CRITERION 3 - THE MOST EASIEST TO EXECUTION

(C3) The Most esiest to execution	A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	A3-(Creating a dedicated team to monitor and evaluateSOP implementation effectiveness)	A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)
A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	1,00	2,00	2,00	0,50	3,00
A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	0,50	1,00	2,00	0,50	2,00
A3 (Creating a dedicated team to monitor and evaluate SOP implementation effectiveness)	0,50	0,50	1,00	0,50	0,50
A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	2,00	2,00	2,00	1,00	2,00
A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	0,33	0,50	2,00	0,50	1,00
Total	**4,33**	**6,00**	**9,00**	**3,00**	**8,50**

Figure 8: Alternatives pairwise comparison based on criteria-3

Figure 13 presents the evaluation of alternatives based on the criterion "The Most easiest to execution," which was obtained through FGD with VALINS practitioners from PT Telkom Indonesia. .

(C3) The Most esiest to execution	A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	A3-(Creating a dedicated team to monitor and evaluateSOP implementation effectiveness)	A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	Priority
A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	0,23	0,33	0,22	0,17	0,35	0,26
A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	0,12	0,17	0,22	0,17	0,24	0,18
A3 (Creating a dedicated team to monitor and evaluate SOP implementation effectiveness)	0,12	0,08	0,11	0,17	0,06	0,11
A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	0,46	0,33	0,22	0,33	0,24	0,32
A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	0,08	0,08	0,22	0,17	0,12	0,13
Total	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**	**1,00**

Figure 9: Alternatives matrix value (Eigen value normalization) based on criteria-3

V.3.1 Calculating Lambda Max

λ max = Σ"Total" at table 13 x Priority (Average) at Figure 14
= (4,33 x 0,26) + (6 x 0,18) + (9 x 0,11) +(3 x 0,32) + (8,5 x 0,13) = 5,27

V.3.2 Calculating consistency index value (CI)

CI = (λ max - n)/(n-1), n= number of alternatives
= (5,27-5)/ (5-1) = 0,07

V.3.4 Calculating consistency ratio value (CR)

CR = CI/RI, where RI is the Random Consistency ratio value determined by the number of n. In this case, the number of n is 5, so the RI value is 1.12.

CR = 0.07 / 1.12 = 0.060.

Based on the above calculations, it is known that the assessment of alternatives based on criterion-3 (The most easiest to execute) has a consistency ratio value of 0.060, which means the subsequent calculations can be performed.

VI. PROBLEM SOLVING AND FEATURE REALITY

VI.1 ANALYSIS OF WEIGHTS AND PRIORITIES FOR ALTERNATIVES

Alternatives	Bobot	Priority
A1- Revising the standart operational procedure (SOP) by mitigating risks in the current procedure	0,328301	1
A2 -Revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning	0,241705	2
A3 (Creating a dedicated team to monitor and evaluate SOP implementation effectiveness)	0,127829	4
A4 (Conducting specialized training and workshops to change proactive understanding of VALINS)	0,20357	3
A5 (Conducting extensive outreach on VALINS as a core activity for new service installation)	0,098595	5

Figure 10: Alternatives priority

VI.2 PROBLEM SOLVING IN FEATURE REALITY

VI.2.1 Injection Problem solving through Future Reality Tree

In the previous discussion, we identified the issues affecting VALINS accuracy and pinpointed several root causes through the Current Reality Tree analysis method. Next, problem-solving solutions were determined through a forum group discussion, from which the best solution was selected using the AHP method. This approach aims to transform Undesirable Effects (UDEs) into Desirable Effects (DEs). Anticipations of potential consequences from implementing these solutions were also established. All these elements can be depicted in a Future Reality Tree (FRT).

One of the alternative solutions selected through the AHP method with the highest weight is "Revising the standard operational procedure (SOP) by mitigating risks in the current procedure." Based on the FGD, several initial injections were identified as Pertinent UDE as follow :

VI.2.2 Future Reality Tree objectives

No	Pertinent UDE	FRT objective
1	Upgrade the map system technology to consider territorial situations.	Improve the validity of the real territorial conditions of ODP in the field.
2	Adding detection technician coordinates feature. If the technician works outside the ODP coordinates recommended by the system, the tool will not support new service installation activities.	Enhance the success of ODP coordinate validation during VALINS.
3	Establish smartphone specifications for performing VALINS.	Ensure a smooth VALINS process.
4	Provide double telescopic ladders with a maximum length of 12 meters as technician tools.	Ensure a smooth VALINS ODP closure process.
5	Conduct location evaluations for ODP placement before the installation process.	Reduce the risk of ODP position changes.
6	Collaborate with relevant parties, such as building owners or local authorities, to minimize environmental changes around ODP closure.	Reduce the risk of ODP position changes.
7	Increase the capacity of the Telegram bot server.	Ensure a smooth VALINS process using Telegram Bot.
8	Create specific SOPs related to work preparation	Ensure a smooth VALINS process using Telegram Bot.
9	Periodically optimize the Telegram application.	Ensure a smooth VALINS process using Telegram Bot.
10	Use durable labels or stickers for ODP labeling.	Make ODP labels last longer with clear text.
11	Monitor and maintain ODP labels regularly.	Make ODP labels last longer with clear text.
12	Enhance the Telegram bot's ability to provide historical coordinate information.	Improve the validity of ODP naming.
13	Implement a location validation system that allows technicians to verify they are at the correct ODP before sharing coordinates.	Improve the validity of ODP coordinates.
14	Equip the VALINS Telegram bot with AI technology to recognize and verify photos.	Enhance the validity of cross-check evidence for VALINS ODP.
15	Improve the Telegram bot's ability to prioritize automatic QR code scanning over manual input.	Improve the validity of QR Code.
16	Add an extra procedure when removing the drop core, requiring a specific code before the technician can press the "YES" button.	Improve the validity of VALINS results.

Figure 6: FRT objective

To build a future reality tree, it is important to determine whether the objectives solve the problems, where finally all the FRT objectives leads to the resolution to the main problem.

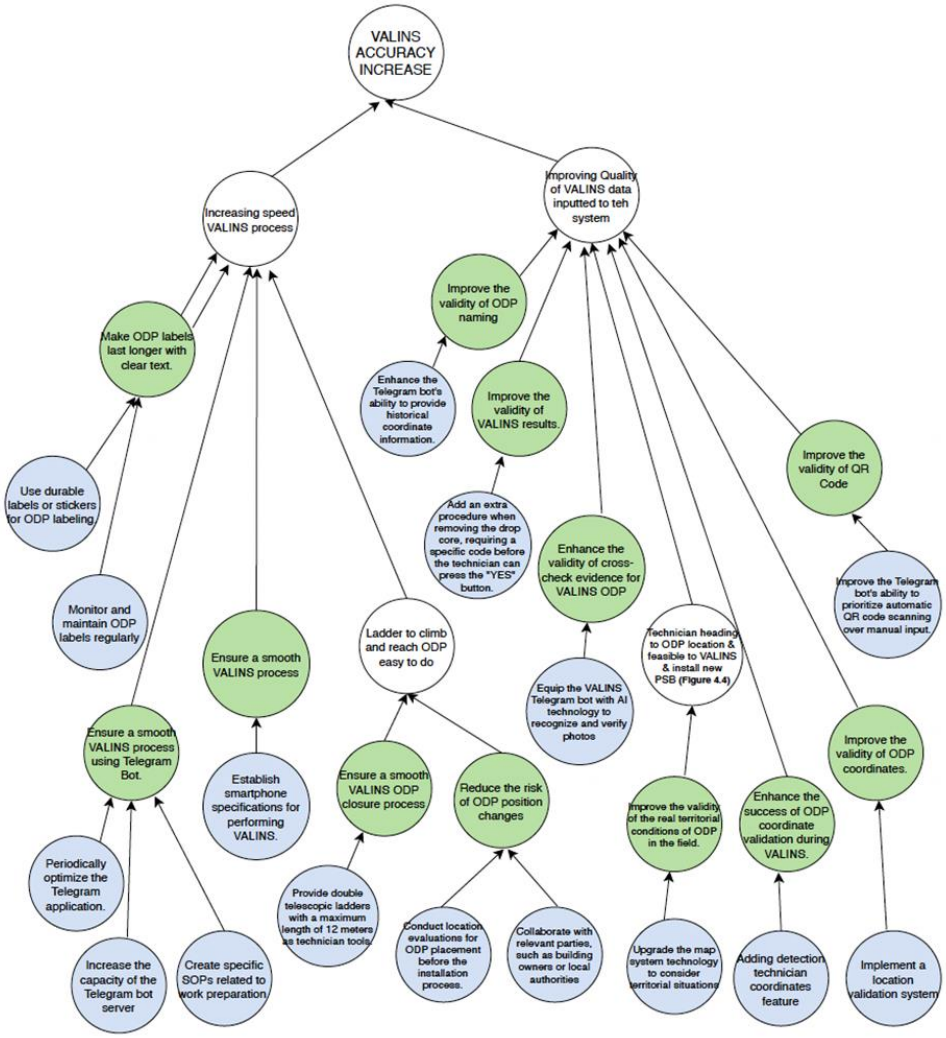

Diagram 3: Future Reality Tree Valins Accuracy

Diagram 5 explain how the injections could reach the objectives and how they connect each other, it can be seen that the injection given represents a new quality control standard, both for facilities and work infrastructure and improvements on tools are made through the optimization of the VALINS process.

VII. CONCLUSION

Based on the analysis of the Quality of VALINS New Service Installation to improve VALINS accuracy at PT Telekomunikasi Indonesia Tbk Regional III West Java, several key points were identified as follows:

Through root cause analysis using the current reality tree approach, four root causes were identified as the factors contributing to the decline in VALINS accuracy: Standard Operational Procedure hinders job quality, no quality requirements in agreements, understanding VALINS from a reactive perspective, and the current knowledge perceives VALINS as important but not urgent.

When comparing these four root causes with the conceptual framework, which refers to previous research and the researcher's common sense, two new root causes were identified: "understanding VALINS from a reactive perspective" and "the current knowledge perceives VALINS as important but not urgent."

From the four root causes, five alternative solutions were identified: revising the Standard Operational Procedure (SOP) by mitigating risks in the current procedure, revising the cooperation agreement between PT Telkom Indonesia and Telkom Akses partners for provisioning, creating a dedicated team to monitor and evaluate SOP implementation effectiveness, conducting specialized training and workshops to change the proactive understanding of VALINS, and conducting extensive outreach on VALINS as a core activity for new service installation.

Based on the FGD results and data processing using the AHP method, "Revising the Standard Operational Procedure (SOP) by mitigating risks in the current procedure" was selected as the priority alternative solution.

From the selected alternative solution, 16 initial injections were identified to design a Future Reality Tree to improve VALINS accuracy.

Through the FGD, the chosen alternative solution is "Revising the Standard Operational Procedure by mitigating risks in the current condition."

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