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Article

Service Performance Analysis Using Fault Tree Analysis (FTA) at the Investment and One-Stop Integrated Services Office (Case Study in Kampar Regency)

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A B S T R A C T

High-quality public service performance is highly needed. However, the Investment and One- Stop Integrated Services Agency (DPMPTSP) of Kampar Regency faces challenges in the form of low service speed, as seen from the results of the 2023 Community Satisfaction Survey (SKM). This study aims to analyze the causes of delays in environmental permit services at the DPMPTSP of Kampar Regency using the Fault Tree Analysis (FTA) method. FTA is used to identify the root causes of failure and the logical relationship between the existing factors. Data was collected through interviews with officials from the DPMPTSP and the Environmental Agency (DLH) of Kampar Regency, as well as document studies. The results of the study show that the delays are caused by three main factors: (1) business actor factors, (2) Technical Regional Apparatus Organization (OPD) factors, and (3) internal DPMPTSP factors. The FTA analysis highlights that business actor factors, such as a lack of knowledge and slow feedback, are the most dominant root cause of the problem. Increased collaboration between business actors and relevant OPDs is needed to accelerate the permit process and improve community satisfaction..

1. Introduction

1.1 Background

Service is essentially a series of activities that takes place routinely and continuously, covering all aspects of life organizations in society by fulfilling each other's needs between recipients and service providers directly (Rukmana and Ismail,2020). Meanwhile, according to Permatasari (2020), public service is a task the main points and obligations for the government that must be implemented andrealized. In its implementation, the government is responsible to provide the best service to the community. Service public services carried out by government officials in serving and providing services to the community requires good performance, so that the services provided can be of high quality. The main task of the Civil Service State Civil Servants (ASN) as government apparatus are to provide the best service to the community, whether the performance is good or bad in general the whole is a reflection of the individual performance of an organization (Subarling et al, 2021).

According to Ariany & Putra in Subarling et al (2021), Performance (performance) is the result of work or work achievement. Performance has broader meaning, not only stating it is the result of work but alsohow the work process takes place and how to do it. Performance is the result of work that has a strong relationship with strategic goals of the organization, customer satisfaction and contributing economy. In the context of public services provided by service apparatus is to make public affairs easier by providing services that not complicated and long procedures. Prioritize public interest over personal interest, shortening time implementation of public services and providing satisfaction to the community as a service recipient to find out the level of satisfaction with the service public needs to be surveyed as evaluation material (Subarling et al, 2021).

The Public Satisfaction Survey (SKM) is one of the efforts that must be carried out in an effort to improve public services. This policy issuedthrough the Decree of the Minister of State for Administrative and Bureaucratic Reform State and Bureaucratic Reform (KEMENPANRB) Number 14 of 2017 regarding the guidelines for the Public Satisfaction Survey regarding the implementation of public services and can be used as a reference in making determinations service improvement priorities. Service quality reflects the condition which creates a dynamic relationship between users and providers services (Sucahyo et al, 2022).

One of the government offices whose activities are providing services public to the community is the Investment and Services Office Integrated One-Stop Service (DPMPTSP) Kampar Regency. The form of service provided given in connection with Investment and Licensing in the region ampar Regency. The Kampar Regency DPMPTSP always strives to improve the quality of service. To measure the level of satisfaction community regarding the service, a Satisfaction Survey was conducted. Community (SKM) to assess the performance of public service delivery periodically at least once a year (Orbawati et al, 2023).

1.2. Research Objectives

The findings of this study are expected to provide a valuable reference for identifying the underlying factors contributing to delays in environmental licensing services, while also serving as a basis for enhancing the overall service performance of DPMPTSP Kampar Regency, particularly in the management of environmental permit

2. Literature Review

2.1 Draft Service

Service in general is any activity intended or aimed at providing satisfaction to customers, through this service the desires and needs of customers can be fulfilled. In the Indonesian Dictionary, it is explained that service is an effort to serve the needs of others, while serving is helping to prepare (helping what someone needs). In essence, service is a series of activities that are a process. As a service process that takes place routinely and continuously covering the entire life of people in society, the process of fulfilling needs through the activities of others (Indrasari, 2019). Meanwhile, according to Kotler (2020:83) service is every action or activity Which can offered by something one party to another, which is essentially intangible and does not result in any ownership.

Service activities play a vital role in human life, as fulfilling one's needs requires the services of others. Service, as the process of fulfilling needs through the direct activities of others, is a concept that remains relevant in various institutional aspects. Service No only in organizations business, but has develop more widely in the government organizational structure.

2.2 Licensing Environmental Permit

Licensing is a legal instrument granted to the government. based on regulation legislation For do special supervision on action Which will done by public (Rachman And Wijaya,2023). The definition of permit in the legal context is not absolute, according to Nomensen Sinamo in Rahman and Wijaya (2023) who defines permit as an approval from the authorities based on laws and government regulations, therefore permits basically contain prohibitions that are excluded based on the approval of the authorities.

An environmental permit is a permit that must be held by every person who carries out a business and/or activity that requires an Environmental Impact Analysis (AMDAL) or Environmental Management Efforts and Environmental Monitoring Efforts (UKL-UPL) in the context of environmental protection and management. life as condition For get permission business and/or activities. From this definition, it can be seen that an environmental permit is issued before the activity is implemented, and to obtain it, the business plan and/or activity must have environmental documents. Therefore, a business permit will not be issued if an environmental permit is not available, and an environmental permit will not be issued if the documents are not available (Mina, 2017).

2.3 Quality of Service

According to Satriani (2018) service quality is the word as service providers who must meet customer needs quickly and right. Service quality is the level of service quality provided based on excellence to meet customer service needs that customers receive. Manengal (2021) states that the quality of service is a dynamic state that is closely related to products, services, human resources, and processes and environments that can at least meet or even exceed the expected quality of service. Dzikra (2020) also stated that service quality is a system strategic involving all work units or organizational units from eaders to employees to meet the needs expected by consumers, then Putri (2020) stated that service quality is the service provided to customers according to with service standards that have been standardized as guidelines in providing services. For further understanding, Armaniah, et al (2019) states that service quality is a level of service that related to the fulfillment of customer expectations and needs or its users. Utomo and Riswanto (2019) also stated that the quality of service can be defined as the level of discrepancy between consumer expectations /desires with their perceptions, then Gunawan, et al (2019) stated that service quality is a measure for assess whether the service has the desired use value or in other words, an item can be said to have quality if the utility value or function is in accordance with what is desired.

2.4 Fault Tree Analysis (FTA)

Fault Tree Analysis (FTA) method is a system analysis method using a top-down approach that starts from the top level failure event from the peak event that has been defined first, then looks for the causal event. And or the combination until on incident Which most base. A the technique that used For identify risk Which play a role to occurrence failure. This method is carried out with a top-down approach , which begins with assumptions failure from incident peak (Top Event), Then detailing the causes something Top Event until on something failure base (root cause). Logic gates describe the conditions that trigger failure, either a single condition and a group from various type condition, Construction from Fault Tree Analysis (FTA) covering gate logic that is gate AND And gate OR (Sukma in Rosaliana Muis, 2022). Furthermore, according to Ferdiana in Sukmana (2021), Fault Tree Analysis (FTA) is an analysis method that aims to identify the relationship between the causal factors of a case study and its output. shaped tree error Which involving gate logic, so that can with easy describe relationships on Which There is on system with the root of the problem that occurred. The FTA method aims to find out the root of the failure something system from

method analysis incident Which No expected so it is called an undesired event , which is then analyzed with existing conditions and operations to find all possible ways that it could happen.

Following This is Excess And Lack Method Fault Tree Analysis (FTA) According to Chengi Kuo in Rosaliana Muis (2022) that is as following:

1. Excess
   a. In case A system Which complex, tree error give a good and logical way to integrate as causes. Construction of diagram tree can determine probability values and help give understanding Which more Good from something system.
   b. Fault trees can be used to perform sensitivity analysis so that the differences from various causes can be compared, the impact on the overall system by analyzing the changes with possible values.
2. The downside is that it requires a great deal of e xperience and knowledge to create a proper tree structure. Mistakes in input can lead to incorrect results.

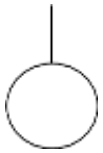
According to Kristiansen in Rosaliana Muis (2022) Symbols used is symbol incident, symbol gate and symbol transfer, following is the form of symbols and the meaning of each symbol, both event symbols, transfer symbols and gate symbols used in the fault tree analysis method, namely as follows:

1) Event Symbol

Event symbols are symbols that contain information about events in a system that exist in a process. the occurrence of a top event. There are 5 symbols, namely:

a. Basic event/primary event

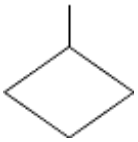
Basic event or primary event or failure fundamental Which no need The cause is sought. This means that this circle symbol represents the final limit of the cause of an event.



Picture 1. Basic Event

b. Undeveloped event

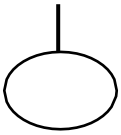
This diamond symbol is used to indicate an undeveloped event or an incident that can no longer develop, namely a particular failure incident for which the cause is no longer sought. Because the incident No not sufficiently related or because there is no information available related to it so that become something incident end from something problem Which happen on a study.



Picture 2. Undeveloped event

c. Conditioning event

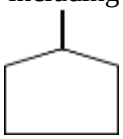
Symbol oval This For state conditioning event , that is something condition or special constraints applied to a gate (usually INHIBIT and PRIORITY AND gates). So the output event occurs if the input event occurs and satisfies a certain condition.



Picture 3. Conditioning event

d. External event

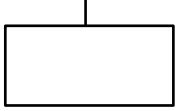
Symbol House used For state external event that is the incident that expected appear in a way normal And No including in incident fail.



Picture 4. External event

e. Intermediate event

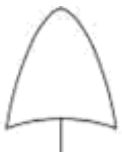
Symbol rectangle long This containing incident Which appear from combination of failed input events entering the gate.



Picture 5. Intermediate event

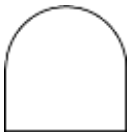
2) Gate Symbol
Symbol gate used For show connection between input events that lead to output events t in other words, output events are caused by input events that are interconnected in certain ways in a system process.

a. Gate OR
OR gate is used to show that an event that will occur if one or more failure events that are its inputs occur.



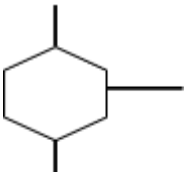
Picture 6. OR Gates

b. Gate AND
Gate AND used For show output events appears only if all inputs occur.



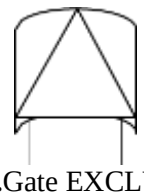
Picture 7. AND Gates

c. Gate INHIBIT
Gate INHIBIT, symbolized with aspect six, is case special from gate AND. Output caused by by One input , but Also must meet certain conditions before input can produc
e output .



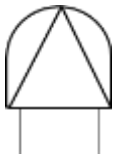
Picture 8. Gates INHIBIT

d. Gate EXCLUSIVE OR
EXCLUSIVE OR gate is an OR gate with a specific case, namely the output event appears if one event also appears.



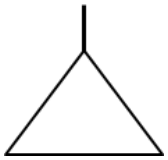
Picture 9 . Gate EXCLUSIVE OR

e. Gate PRIORITY AND
Gate PRIORITY AND is gate AND with condition Where incident output appear only If all input events appear with order certain.



Picture 10. Gate PRIORITY AND

3) Symbol Transfer
a. Triangle- in
Triangle-in or transfers-in , period Where sub-fault tree can started as a continuation of the transfers out.



Picture 11. Triangle- in

According to Brown in Sukmana (2021), the following are several terms in the method FTA, namely:

1. Event : an unexpected storage of a normal state in a system component.
2. Top Event : the desired event at the top of the fault tree that will be further analyzed towards other basic events using logic gates to determine the cause of the failure.
3. Logic Gate : connection in a way logic between input stated in " and " And " or ".
4. Transferred Event : triangle as a transfer symbol, indicating that the further description of the event is on another page.
5. Undeveloped Event : a basic event that is not developed further because further information is not available.
6. Basic Event : Incident Which No expected Which considered as reason basis so that no further analysis is required.

Symbols on FTA can seen on Picture 2.12 in lower This:

Table 1. Symbols on Fault Tree Analysis

Simbol	Keterangan
	Top Event
	Logic Even OR
	Logic Event AND
	Transfired Event
	Undeveloped Event
	Basic Event

According to Priyanta in Yudhagama (2020), FTA in a way general done in 4 stages, namely:

1. Define problem And condition limit from the system.
   In define problem And limit Which happen, need determined top event In a fault tree, the top vent must be defined clearly and unambiguously so that the top event always provides answers to the questions of what, where, and when. Also in determining the boundaries of the system is how detailed the author will be. identify the factors that cause failure.
2. Construction Fault Tree.
   In constructing a fault tree, it is necessary to start from the top event that has been defined, so that the failure factors that have been obtained must be connected to the top event using logic gates .
3. Do analysis qualitative from Fault Tree.
   Qualitative analysis of the fault tree can be done by determining the delay factors and providing a descriptive explanation of why these factors occur.
4. Do analysis quantitative from Fault Tree.
   In quantitative analysis, which uses reliability theory to solve it.

3. Research Methodology

This study uses a qualitative-descriptive approach to analyze service performance issues at the Kampar Regency DPMPTSP. This approach was chosen because it allows researchers to gain a deeper understanding of the phenomenon. delays in licensing from various perspectives.[3] The main focus of the research is The application of the Fault Tree Analysis (FTA) method, a top-down, deductive analytical technique that systematically identifies the root causes of failure by visualizing the logical relationships between various factors. FTA is used to decompose the main problem, namely "Delay in Completion of Environmental Permits" as the top event, into a series of intermediate events and underlying root causes (basic events).[4] Data collection is done through Two main methods were used: in-depth interviews and document review. Interviews were conducted with two key officials at the DPMPTSP (Regional Development Planning Agency) and one official at the Kampar Regency Environmental Agency (DLH). These interviews aimed to gather information related to standard procedures, operational constraints, and factors that directly and indirectly caused delays. Meanwhile, document review was conducted by reviewing internal DPMPTSP reports, including the 2023 Community Satisfaction Survey (SKM) and recapitulation data on environmental permit issuances over a specific period. This secondary data was used to validate the interview findings and provide a quantitative overview of the scale of the problem.

The data analysis stages in this research include three main steps: (1) Identification and classification of factors causing delays obtained from interviews and document studies. (2) Determination of top events and intermediate events to build a FTA logic framework. (3) Construction of a failure tree diagram (FTA) that visualizes the logical relationships between causes using logic gates (AND/OR). The results of this analysis then become the basis for formulating targeted improvement recommendations.

4. Results and Discussion

4.1 Data Collection

Based on data analysis and interviews, this study found that the performance of environmental permit services at the Kampar Regency DPMPTSP remains far from optimal. The average percentage of permit issuances completed according to the SOP (7 days) is less than 50%, indicating a significant gap between the established service time standards and the reality on the ground.

This finding aligns with the results of the 2023 Public Satisfaction Survey (SKM), which ranked service speed the lowest, reinforcing the indication that this issue is a crucial issue requiring serious attention. The following is data related to permits published through the SICANTIK Cloud Application (Service Application)Integrated Licensing for the Public):

Table 2. Data issued through the SICANTIK Cloud Application

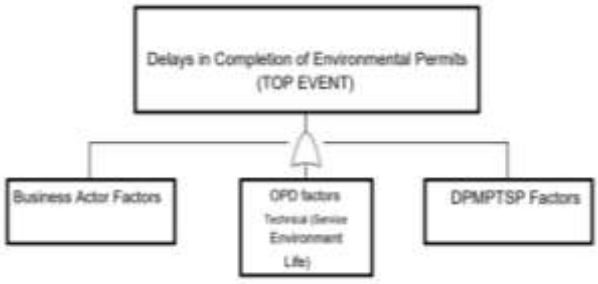
No.	Month/ Year	Number of Entry Permits	Number of Permits Issued according to SOP
1.	January/2023	2	1
2.	February/2023	4	2
3.	March/2023	3	1
4.	April/2023	5	3
5.	May/2023	5	2
6.	June/2023	5	2
7.	July/2023	6	2
8.	Agust/2023	3	2
9.	September/2023	4	1
10.	October/2023	4	1
11.	November/2023	6	2
12.	December/2023	5	2
	Total	52	21

Source: Processed data, 2024

Based on the table above, it can be seen that the average percentage Issuance of Environmental Permits that can be completed in accordance with SOP less than 50%. Should be in accordance with commitments, Environmental Permits can be issued no later than 7 (seven) working days after the recommendation from DLH. The low percentage of permit issuance is caused by several factors internal and external.

4.2 Determining Top Events

The creation of an FTA begins with determining the peak event (top event) and intermediate event first level by using logic gate, the purpose is to determine the tree fault tree structured between causes with other causes so that the possibility is known the occurrence of causal factors systematically. Determining the relationsh intermediate event level one to the peak event in the permit process environment obtained from data analysis and literature studies on factors that influence delays. In Figure 4.1 is the result of top event analysis:



Picture 12. Top Event and Intermediate Event First Level

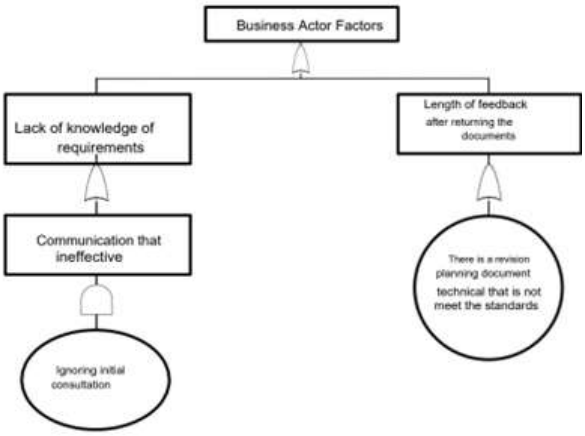
4.3. Fault Tree Analysis (FTA) Graph

After determining the intermediate events at the first level, The next step is to determine the intermediate events for the level. next and determine the basic event. This determination aims to obtain the relationship between top events and factors that causing delays. Then the next step is perform FTA construction drawing. In drawing fault The tree uses standard symbols to facilitate analysis.

The steps for constructing an FTA are as follows:

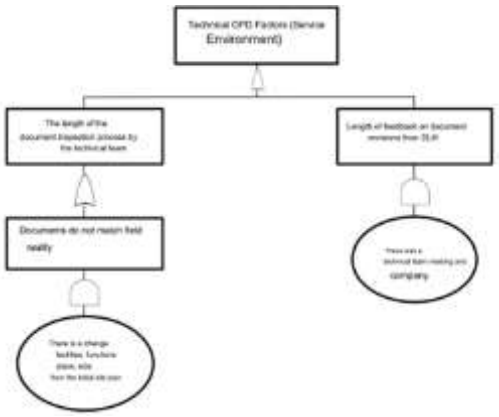
1. Determine the predetermined peak event (top event) previously.
2. Determine the first level intermediate event for the incident peak.
3. Determine the relationship between the first level intermediate event and the top event by using logic gates .
4. Determine the second level intermediate relationship .
5. Determine the relationship of the second level intermediate event to first level intermediate event using gates logic (logic gate).
6. Continue to the basic event.

The following is the FTA construction of the environmental permit process which was concluded based on interviews conducted together The Complaints Officer of the Kampar Regency DPMPTSP is as follows:



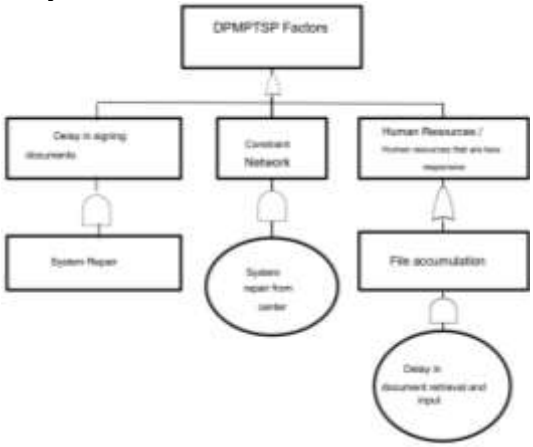
Picture 13. FTA Construction Environmental Permit Process Top Event 1 (Business Actors)

Business Actor Factor : This factor was found to be the most dominant cause. Lack of knowledge among business actors regarding licensing procedures and requirements, coupled with ineffective communication, is often the starting point of problems. Many businesses submit incomplete documents, forcing the verification team to return them and request revisions. This triggers a protracted feedback cycle, with businesses slow to respond to requests for document corrections. This directly contributes to file backlogs and inefficient waiting times.



Picture 14. FTA Construction Environmental Permit Process Top Event 2

Technical OPD (Environmental Agency) Factors: While not the primary cause, these factors also contribute to delays. The process of verifying technical documents and field reviews conducted by the OPD team often takes longer than scheduled. This situation is exacerbated by discrepancies between the data in the documents and actual conditions in the field, which requires revisions and additional coordination meetings. Although the technical OPD has attempted to address these obstacles, asynchronous coordination and a lack of standard time standards for internal processes within the OPD have resulted in suboptimal efficiency.



Picture 15. Construction Environmental Permit Process Top Event 3 (DPMPTSP)

Internal Factors at the DPMPTSP: Delays were also found to originate internally at the DPMPTSP. Obstacles such as network system repairs and the sometimes time- consuming signing of documents by the Head of the Service hamper the process.

The FTA diagram constructed (shows that these three factors are logically interconnected, but the FTA identifies that the existence of problems in the business actor factor is the fundamental cause. When business actors do not understand the procedures and are not cooperative, the problem will spread to the process at the technical OPD and DPMPTSP, which ultimately delays the completion of permits. Thus, improvements in the business actor factor have the greatest potential impact in increasing overall service efficiency.

5. Conclusion

This study concludes that delays in environmental permit processing at the Kampar Regency Department of Public Works and Public Housing (DPMPTSP) are caused by three main factors, with business actors being the most crucial. The analysis reveals that the underlying problem lies in the discrepancy between submitted documents and field reality, triggered by a lack of knowledge and ineffective communication on the part of business actors. This situation creates a domino effect that spreads throughout the process, including obstacles within the technical and internal DPMPTSP departments.

To significantly increase service efficiency, a collaborative strategy is needed between DPMPTSP, the Environmental Service (DLH), and business actors. The DPMPTSP and the Environmental Agency (DLH) need to strengthen synergy in educating and providing more intensive assistance to business actors. More intensive outreach regarding the importance of fulfilling requirements completely and correctly from the outset will minimize revisions and expedite the workflow. Furthermore, the DPMPTSP and DLH can establish a faster and more transparent feedback mechanism to ensure any identified issues are promptly addressed.

With improvements that focus on the root of the problem, namely business actor factors, it is hoped that the efficiency of licensing services will increase, which will ultimately have a positive impact on increasing public satisfaction.

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