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OPTIMIZATION OF IT SERVICE DESK RESOURCE ALLOCATION IN AN OIL AND GAS COMPANY (PT. X) USING WORKLOAD ANALYSIS METHOD

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OPTIMIZATION OF IT SERVICE DESK RESOURCE ALLOCATION IN AN OIL AND GAS COMPANY (PT. X) USING WORKLOAD ANALYSIS METHOD

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ABSTRACT

The Service Desk has been an integral part of Information Technology (IT) function in many companies. It acts as a single point of contact (SPOC) for IT users when they encounter IT incident or to request IT services. In PT. X, an established oil and gas company in Indonesia, IT Service Desk function has been implemented based on Information Technology Infrastructure Library (ITIL) best practices and outsourced to a third party company by using a fix allocation of resource contract scheme. The service contract is renewed periodically every three years by performing tender process. PT. X need to ensure good quality of IT Service Desk service by developing Service Level Agreement (SLA) with its users and customers and define 85% SLA performance as Key Performance Indicator (KPI). Since current SLA achievement is consistently high above 95%, there is an indication that the current resource allocation is not efficient and current IT Service Desk is on over-staffing situation. The historical Service Desk incident data is recorded in IT Service Management Tools and retrieved using Data Analytic Tools. The data has not been used for any analysis related to workload of IT Service Desk. This thesis attempts to analyze the workload of Service Desk and to investigate if current resource allocation can be optimized. Due to decreasing price of oil and gas, the cost reduction efforts need to be initiated. Based on the result, the optimal number of Service Desk resource can be reduced from 24 person to 18 person with the overall cost reduction of 48% and cost per ticket is reduced from IDR 238,976/ticket to IDR 123,698/ticket. The new resource allocation will be recommended to be implemented in the next contract renewal.

Keyword: Workload Analysis, Service Desk, Resource Allocation, Service Costing, Data Analytic.

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OPTIMASI ALOKASI SUMBER DAYA SERVICE DESK TI DI PERUSAHAAN MINYAK DAN GAS (PT. X) DENGAN MENGGUNAKAN ANALISIS BEBAN KERJA

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ABSTRAK

Service Desk telah menjadi bagian integral dari fungsi Teknologi Informasi (TI) di banyak perusahaan. *Service Desk* TI berperan sebagai satu titik kontak untuk pengguna TI ketika mereka mengalami insiden IT atau untuk meminta layanan TI. Di PT. X, perusahaan minyak dan gas yang sudah mapan di Indonesia, fungsi *Service Desk* TI telah diimplementasikan berdasarkan praktik terbaik *Information Technology Infrastructure Library (ITIL)* dan dialihdayakan ke perusahaan pihak ketiga menggunakan skema kontrak dengan jumlah alokasi sumber daya yang tetap. Kontrak layanan diperbarui secara berkala setiap tiga tahun dengan melakukan proses tender. PT. X harus memastikan kualitas layanan *Service Desk* TI yang baik dengan mengembangkan *Service Level Agreement* (SLA) dengan para pengguna dan pelanggannya dan mendefinisikan 85% kinerja SLA sebagai *Key Performance Indicator (KPI)*. Pencapaian SLA saat ini secara konsisten cukup tinggi di atas 95%, sehingga ada indikasi bahwa alokasi sumber daya saat ini tidak efisien dan *Service Desk* TI saat ini berada dalam situasi kelebihan staf. Data historis insiden *Service Desk* dicatat dalam *IT Service Management Tools* dan diambil dengan menggunakan *Data Analytic Tools*. Data tersebut belum pernah digunakan untuk analisis yang terkait dengan analisis beban kerja *Service Desk* TI. Tesis ini mencoba untuk menganalisis beban kerja *Service Desk* dan untuk menyelidiki apakah alokasi sumber daya saat ini dapat dioptimalkan. Karena penurunan harga minyak dan gas, upaya pengurangan biaya perlu dimulai. Berdasarkan hasil penelitian ini, jumlah sumber daya yang optimal dapat dikurangi dari 24 orang menjadi 18 orang dengan pengurangan biaya sejumlah 48% dan biaya per tiket berkurang dari Rp 238,976/tiket menjadi Rp. 123,698/tiket. Alokasi sumber daya yang baru ini akan direkomendasikan untuk dapat diimplementasikan dalam perpanjangan kontrak berikutnya

Kata kunci: Analisis Beban Kerja, *Service Desk*, Alokasi Sumber Daya, Biaya Layanan, *Data Analytic*.

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PREFACE

The writer praise to Allah SWT for His plenty of grace and guidance, so this thesis can be carried out as expected. The research is intended to fulfill one of the requirements to obtain a Magister Management Technology (M.MT) Degree with the majoring of Industrial Management in Institut Teknologi Sepuluh Nopember (ITS) Surabaya.

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The writer realizes that the thesis is not perfect, so all suggestions are very welcome to enhance this research. The writer wishes, the thesis can be used by the company and/or for performing further research.

Balikpapan, 28th July 2018

The Writer

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CHAPTER 1
INTRODUCTION

1.1. Background

PT. X is a subsidiary of Indonesia national energy company which has operation area located in Mahakam Block in East Kalimantan. The operation has been transitioned from a French Oil and Gas company since 1 January 2018. PT. X has been the country's largest gas producer since 2000 which represents 25% of Indonesia gas production and currently accounts for 82% of the Local LNG Plant's supply in East Kalimantan. The operation of oil and gas production sites need continuous support from different core and support disciplines such as Field Operation, Geoscience, Human Resource, Finance, and Information System & Telecommunication (IST). IST division in PT. X serve more than 4000 of IT users and provide different Information Technology (IT) services as defined in the IT service catalogue. The company has implement IT Service Management (ITSM) methodology as best practice to manage IT services based on Information Technology Infrastructure Library (ITIL). Based on the ITIL approach, one of the key function of IT Operation is IT Service Desk. IT Service Desk act as single point of contact (SPOC) between service providers and users or customers. It is also a focal point for reporting incidents (disruptions or potential disruptions in service availability or quality) and for users making service requests.

IT Service Desk operation in PT. X has been outsourced to third party since beginning of 2005 as part of company strategy to focus on its core business activities. The contract is renewed every 3 years by performing call for tender and following procurement policy as defined in Guidelines for Supply Chain Management of Contractor Production Sharing Contract (PTK 007 revision 4). The next contract renewal is scheduled on 31 October 2018. The current contract scheme is a service based on fixed allocation of resource as shown in Table 1.1.

Table 1.1 Service Desk Resource Allocation

No	Service Description	Number of Personnel	Main Responsibility
1	Service Desk Supervisor	1	Manage Service Desk Team
2	Call Centre	4	Receive and Record IT Incident, and perform First Call Resolution
3	Admin Support	1	Manage PC and Peripheral Loan Service, Monitor Helpdesk SLA
4	Intervention Team JKT	3	Perform User Intervention on provide incident resolution
5	Intervention Team BPN	5	Perform User Intervention on provide incident resolution
6	Intervention Team sites	10	Perform User Intervention on provide incident resolution
7	Supervision and Monitoring	2	Monitor IT Services 24x7, record and escalate to 2nd level support
8	Standby BPN	2	Dedicated VCON & Event support team
9	Standby JKT	1	Dedicated VCON & Event support team
10	Application Support	2	Manage availability of IT Application
11	Infrastructure Support	1	Manage availability of IT Infrastructure
12	Asset Distribution	1	Manage IT Asset
13	ITSS -Application Support	1	Manage availability of IT Application
14	ITSS -Infra Support	1	Manage availability of IT Infrastructure
15	ITSS-EUS Support	1	Manage IT Asset
16	ITSS-MQR Support	1	IT Assistance, Reporting & Documentation
Total Number of Personnel		37	

The Service Desk contract in PT. X consist of the following activities:

1. IST Service Desk Operation, Single Point of Contact for IST users and provide end to end ownership of incident management and service request management (e.g., logging, tracking, resolution and reporting). The service consist of the following services:
   a. Service Desk Call Center, who record and monitor incident management.
   b. Intervention Team, with responsibility to provide advance resolution for user which operate in 3 different areas (Jakarta Head Office, Balikpapan Base Office, and Operation Sites in East Kalimantan District).
   c. Video Conference (VCON) support team, with main responsibilities to setup, configure and provide support related to company video conference system.
   d. IT Supervision and Monitoring Team, as part of event management system who can detect and monitor IT service failure proactively before user reporting a complaint to Service Desk.
2. IST System Support Operation, provides second level support related to IT Infrastructure and Application, and Asset Management.

3. IST IT Support Assistance - Method & Reporting Services, provides support related to Method and IT Reporting services.

PT. X has developed Service Level Agreement (SLA) with the business. It measures the percentage of total ticket that completed within target resolution time and total ticket. The Service Desk ticket SLA achievement is one of the Key Performance Indicator of IST Division Performance and monitored on weekly basis (Table 1.2)

Table 1.2 Weekly Indicator of Service Desk SLA

Service Elements	Score	Indicator
Service Availability	99.98%	Decreasing
End User Facilities Delivery	100.00%	Constant
Call Handling	84.50%	Increasing
Service Desk Ticket	97.50%	Increasing
IS Security Status	99.00%	Constant

Currently the SLA achievement for Service Desk is consistently above target (95% or higher) from the expected target of 85% as shown in Figure 1.1. These numbers are very good in term of service delivery but high SLA achievement is an indication that there may be an inefficiency in Service Desk process since all the task or the workload generated by users can be handled by Service Desk and it may be a sign if current Service Desk is on over staff situation. Therefore it is necessary to have a workload analysis on current resource allocation of service desk to detect possible inefficiencies, reduce or optimize resource allocation which will then directly impact to reduce Service Desk cost in the future.

1.2. Problem Statement

Based on the background, the problem is related on how to analyze existing workload of Service Desk, and based on the analysis, to optimize resource allocation to reduce the overall service cost. The historical data of Service Desk ticketing system has not been used for any analysis other than operational reporting.

Decreasing price of oil and gas requires the company to perform cost reduction initiative in every line of business including in Information System and Telecommunication division as contract owner of Service Desk contract.

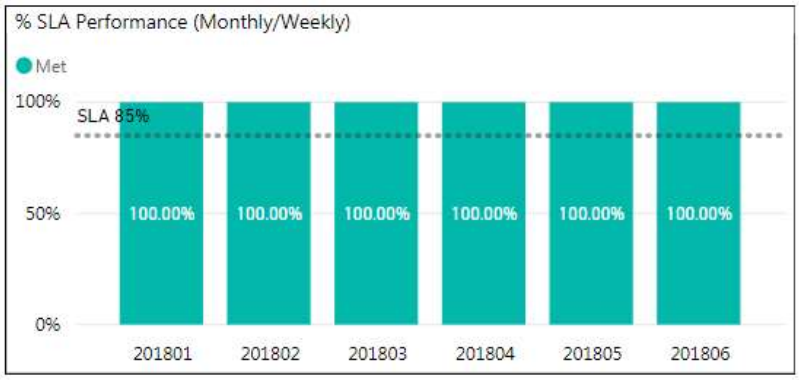

Figure 1.1 Monthly Service Desk Service Level Agreement.

1.3. Research Objective

The objectives of this thesis are as follow:

1. Perform quantitative analysis in order to determine current Service Desk workload.
2. Determine optimal number of Service Desk resource required to manage existing and future workload for minimizing cost of Service Desk.

1.4. Scope

In order to be focus, the scope of this thesis is as follows:

1. The scope of optimization should only consider Service Desk Operation (Service Desk Call Center, Intervention team, Supervision team, and Video Conference & Standby Support team). Due the different nature of service in the contract, IT System Support and IT Assistance are managed by different department and have specific service constraint (acquired knowledge, familiarity with current environment and application and specific skill and experience required by these services).

2. All secondary data are gathered from existing Call Detail Record and ITSM Tools (BMC Remedy v9) using business intelligent & data analytics processing using available tools in the company (Power BI).

1.5. Assumption

The assumptions in the thesis are as follow:

1. Ticket incident handling should not consider pending activity due external factors such as waiting for user, unavailability of spare part, major issue in data center (electrical failure, data corruption, virus attack).
2. Capabilities of Service Desk to perform technical solution are the same.

1.6. Benefit

The benefits of this thesis are as follow:

1. Support the company to determine optimal Service Desk resource allocation.
2. Minimize total cost of service by still maintaining the SLA performance.

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CHAPTER 2
LITERATURE REVIEW

2.1. Service Desk Operation

The Service Desk is the single point of contact for users when there is a service disruption, for service requests, or even for some categories of Request for Change (RFC). The Service Desk provides a point of communication to the users and a point of coordination for several IT groups and processes. PT. X has implemented Service Desk operation which consist of the following services:

1. Service Desk Call Center which act as single point of contact (4 service desk personnel located in Balikpapan with working hours 07:00 WITA to 19:00 WITA).
2. Intervention Team Balikpapan Office which has main responsibilities to handle both incident and service request management for Balikpapan users (5 service desk personnel with working hours 07:00 to 19:00 WITA).
3. Intervention Team Jakarta Office which has main responsibilities to handle both incident and service request management for Jakarta users. (3 Service Desk personnel with working hours 07:00 to 17:00 WIB).
4. Intervention Team Sites Office which has main responsibilities to handle both incident and service request management for Jakarta users. (5 Service Desk personnel working in 2 weeks rotational period in Sites SPS, HDL, CPU, NPU, and SPU, with working hours 07:00 to 19:00 WITA).
5. Video Conference & Stand by Support with main responsibilities to support Video Conference session (2 Service Desk personnel in Balikpapan and 1 personnel in Jakarta with working hours 07:00 to 19:00 WITA).
6. Service Desk Administration (Supervisor and Admins with working hours 07:00 to 19:00 WITA)

A typical call flow from IT user to request IS service is shown in Figure 2.1. an IT user can make IT service request via a self-service portal or call Service Desk call center to report an incident. Service Desk is responsible for the following process:

a. Request Management Process

   Once an IT user created a service request in the portal, the request will be routed for approval to his/her manager depending type of service requested. After approval workflow is complete, ticket will be routed a defined support group who is responsible to deliver the service.

b. Incident Management Process

   In the case of Incident, Service Desk call center will create a ticket in ITSM tools and assigned to intervention team based on user location. Service Desk Call Center will put mandatory information such as Operational Category and Group support who will handle the ticket resolution.

In both cases, Service Desk team can be assigned to work on incident or request. All ticket process (creation, updates, and closure) are all recorded in the ITSM tools. In case Service Desk team is unable to resolve it due to external issues such as lack of system permission for example, the ticket will be routed to 2nd level support or IT system support in Operation Department. IT System Support team is responsible to make resolution and close the ticket. Incident or request ticket which is handled by Service Desk will updated and closed once the resolution found.

Performance of Service Desk can be measured in different performance metrics. Some of the performance metrics are as follows,

1. Number of tickets processed under resolution time and ticket/Service Desk ratio.
2. Response Time or Wait Time which measure how long a user submit a service request and Service Desk agent handle the ticket.
3. Cost Per Ticket, Closed Ticket per service desk resource
4. Ticket Growth overtime and backlog
5. Top IT services with the most Incident

This metrics is useful to perform continuous improvement process by increasing the target achievement.

2.2. Workload Analysis

Workload Analysis is a methodology to determine the time, effort and resources necessary to carry out operations, resulting in identifying the

organization's actual needs of human resources both in terms of quality and quantity, and develop these resources to achieve the organization goals and strategies. There are many concepts of workload analysis that has been defined by many in professional and academic world. There is no consensus on how workload analysis should be done as it depends on the expert knowledge and working discipline. The main goal of workload analysis is how to match between workload requirement and the number of resource required to perform the work efficiently to achieve required production output. As part of a systematic process of developing the efficient work center is the establishment of time standards. These can be determined by using estimates, historical records, and work measurement procedures (Niebel, 2002). According to (Chase, 2006), there are four basic techniques for measuring work and setting standard. These consist of two direct observational methods and two indirect methods as follows,

1. Direct – time study which uses a stopwatch to time the work.
2. Direct – work sampling which entail recording random observation of a person or team at work.
3. Indirect – predetermined motion-time data systems (PMTS) which sum data from table or generic movement times develop in the laboratory to arrive at a time for the job.
4. Indirect - elemental data which sum times from a database of similar combination of movement to arrive at job time.

The choice of the method depends on the level of detail desired and the nature of the work itself. Time studies can be time-consuming and costly and many companies have accumulated large files of time-study data over time for elements common to many jobs throughout their organization (Russel, 2011). Instead of conducting an actual time study, these elemental standard time files can be accessed to derive the standard time, reducing the time and cost required for the time study. Elemental data is the preferred choice to reduce the need for direct observation when the work is done in conjunction with fixed-processing-time equipment (Chase, 2006). This can be accomplished using custom built software or the work itself has necessity to use database system to record work.

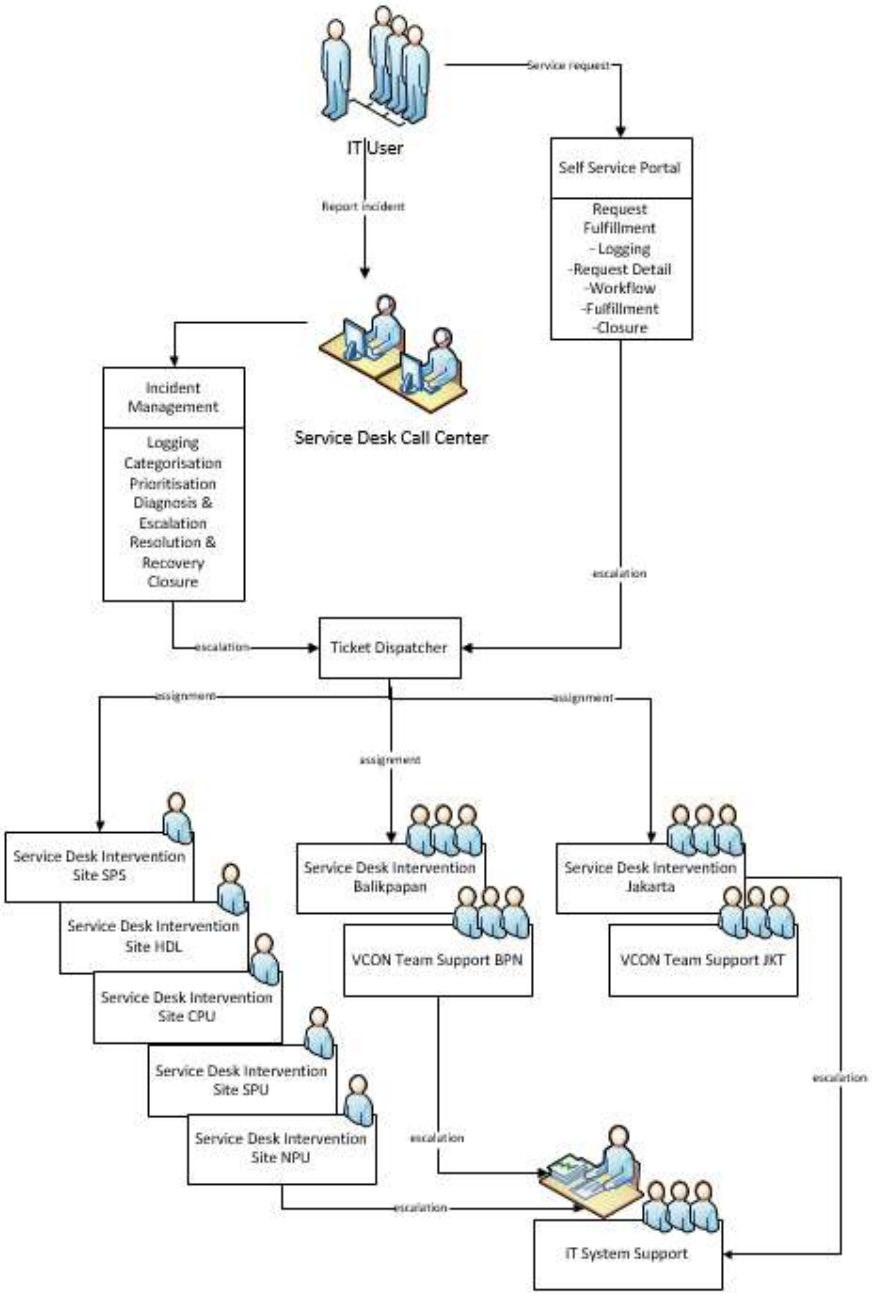

Figure 2.1 Call flow process of service request and service incident

The main principal of work measurement is to breakdown the work into work elements and measure each element either by direct observation or by indirect means such as activity records stored in paper or database system. The average

times for each element are added, yielding the performance time for operator with additional consideration to take into account the speed or performance rating to normalize the job (Chase, 2006). In equation form is defined in equation 2.1.

$$NormalTime\ (\mathrm{NT})\ \ Performance\ time\ per\ unit\ x\ Performance\ Rating \tag{2.1}$$

When an operator is observed for a period of time, the number of units produce during this time, along with the performance rating, gives,

$$NormalTime\ (NT) = \frac{Time\ Worked}{Number\ of\ Unit\ Produced} \times Performance\ Rating \tag{2.2}$$

Standard time is derived by adding to normal time allowance for personal needs (such as washroom and coffee break), unavoidable work delays (such as equipment breakdown or lack of materials) and worker fatigue (physical or mental).

$$Standard\ Time\ (ST) = NT(1 + Allowance) \tag{2.3}$$

2.3. Line Balancing

The result of work measurement using time and motion studies can be used to aligned operation within a specific production line in the manufacturing sector, a concept known as line balancing. Line balancing is used to minimize production fluctuations and operational downtime. Because line balancing requires the use of time and motion studies, it can be difficult to apply in those cases where the work elements in a process cannot be defined, such as in new product development. However, applying the line balancing approach for an IT organization involved in application maintenance and production support such as Service Desk, can be achieved by using a sequence of steps as follows (Lochan, 2013),

1. Calculate Takt Time

Takt time or throughput rate is the rate of customer demand and the time that is needed to complete a process. This is similar to Standard Time calculation from equation (2.3) as follows,

$$Takt\ Time = \frac{Available\ Working\ Time}{Total\ Production\ Unit} \tag{2.4}$$

2. Create Process chart to draw relationship and the sequencing between different activities in a process. Figure 2.2 represent an example of process chart for operation in service desk.

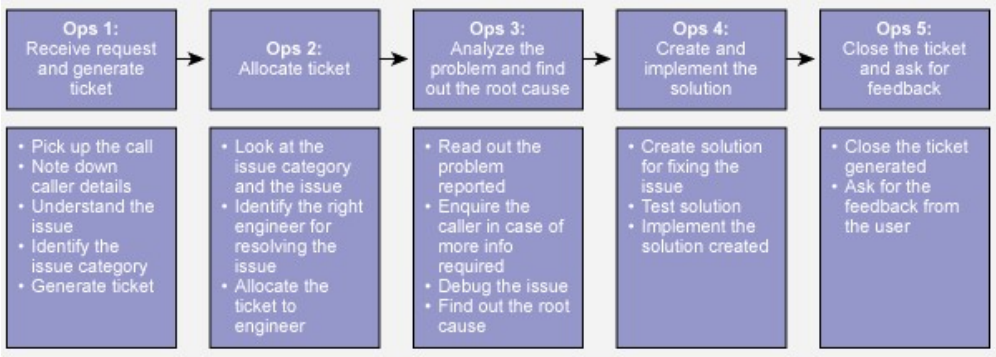

Figure 2.2 Top down approach in IT (Lochan, 2013)

3. Calculate time required for activities

   An efficient line balancing must take into account the effort required to carry out various necessary process activities. This determination can be done using workload measurement method for the activities carried out in the process. The time calculated to complete the process activities should be used to calculate the total cycle time (the total time taken to perform work on the product from start to finish, including processing time and delays) and the processing time.

   $$Number\ of\ workstations = (Total\ Cycle\ Time * K) / Takt\ Time \tag{2.5}$$

4. Measure Takt Time vs Cycle Time

The takt time vs. cycle time bar graph in Figure 2.3 provides an opportunity to identify two important aspects of this process:

a. the maximum throughput rate that can be achieved with the existing process by identifying the longest bar in the graph.
b. the zones of inefficiencies in terms of the idle time and possible instances of work in process (WIPs).

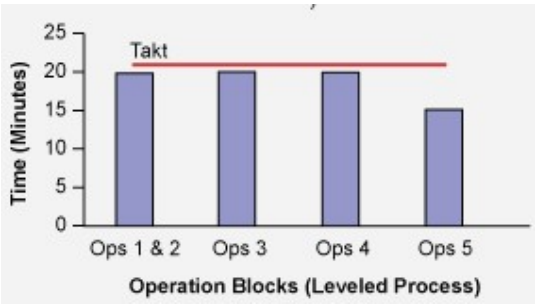

Figure 2.3 Takt Time vs Cycle Time (Lochan, 2013)

5. Restructure Activities

   To balance the work load, a restructuring of the process activities is needed, requiring consideration of the constraints of accumulation and segregation of the work activities. While restructuring is being done, it should consider the following subject:

   a. Activities that cannot be done together.
   b. Activities that have to be done together and cannot be separated.
   c. Activities that could be done only by a specific resource.

6. Measure the Improvement

   Line balancing helps in achieving an efficient line, which utilizes resources proportionately. Line efficiency is one metric that can be used for measuring the improvement achieved through line balancing. Line efficiency can be calculated by using the equation (2.6),

   *Line efficiency = (Total cycle time) / (No. of workstations * Takt time)* (2.6)

The time and effort to complete a product or service can be calculated using workload measurement and line balancing to utilize the resource to produce the output demanded by customers.

2.4. Service Desk Call Center

Call centers has become a primary mode of communication with customers for a majority of companies, primarily in service sectors (Nag, 2017). Workload of Service Desk Call Center depend on the number of calls received during certain period of time and the duration of the received call which is known as Average Handling Time (AHT). Number of optimal Service Desk Call Center can be found using Erlang C formula as in equation (2.7),

$$p\,(>0) = \frac{\frac{A^N}{N!}\left(\frac{N}{N-A}\right)}{\sum_{x=0}^{N-1}\frac{A^x}{X!} + \frac{A^N}{N!}\left(\frac{N}{N-A}\right)} \tag{2.7}$$

Where,

A = Total traffic (in Erlang C)

N = Number of resource

P(>0) = probability of delay

P = Probability of loss – Poisson formula.

The relationship of service level and delay probability can be shown in Figure (2.4). The number of Service Desk Call Center should be increased to satisfy required service level and reduced user waiting time. Erlang calculation can be performed by using available tools online provided that the following parameter are known:

a. Number of phone calls
b. Time period (hours)
c. Average Call Duration (Average Handling Time)
d. Service Level (percentage of call answered within a period of time)
e. Shrinkage which is basically the allowance time similar in equation (2.3)

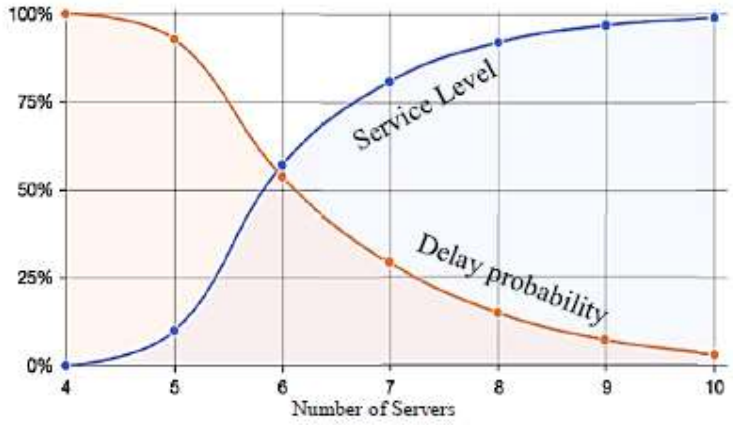

Figure 2.4 Relationship between no of agent, delay probability and service level in Erlang C model (Nag, 2017)

2.5. Test of Call Arrival Distribution

In order to estimate call center parameters to be used in Erlang formula, call arrival and average handling time data need to be checked for fitness to Erlang distribution. The Goodness of Fit (GOF) tests measure the compatibility of a random sample with a theoretical probability distribution function.

The Kolmogorov-Smirnov (K-S) test is an appropriate tool to determine if a hypothesized distribution fits a data set. This test is used to decide if a sample comes from a hypothesized continuous distribution. It is based on the empirical Cumulative Distribution Function (CDF). Assume a random sample in ordered data points $t_1, \ldots, t_n$ from a distribution has CDF, $F(t_i)$. The empirical CDF is denoted by (MathWave, 2017):

$$\hat{F}(t_i) = \frac{N(i)}{n}, \tag{2.8}$$

where:

$\hat{F}(t_i)$ = observed / empirical CDF,

n = number of observations,

$N(i)$ = number of points less than t_i,

t_i = ordered data points from the smallest to the largest value.

The Kolmogorov-Smirnov test (D) is based on the largest vertical difference between the theoretical and the empirical cumulative distribution function:

$$D = \max_{1 \le i \le n} \left| F(t_i) - \hat{F}(t_i) \right|, \tag{2.9}$$

where $F(t_i)$ is CDF of theoretical (hypothesized) distribution (NIST, 2013)

The Kolmogorov-Smirnov test is defined by the following hypothesis:

H_0 : the distribution represents the data

H_1 : the distribution does not represent the data

The hypothesis regarding the distributional form is fail to be rejected at the chosen significance level (α) if the K-S test statistic (D) is lower than the critical value obtained from K-S table (NIST, 2013). In other word, if $D < D_{\text{critical}}$ than H_0 is fail to be rejected means the distribution represents the data.

2.6. IT Service Management Implementation

Providing IT services to customers with better guaranteed quality has been the aim of many diverse efforts, undertaken under the common denominator of IT Service Management (Brenner, 2006). IT service management is often equated with the Information Technology Infrastructure Library (ITIL), even though there are a variety of standards and frameworks contributing to the overall ITSM discipline. As defined by ITIL, IT Service Management (ITSM) is the implementation and management of quality of IT services that meet the needs of the business and performed by IT service providers through an appropriate mix of people, process and information technology (OGC, 2011). As a set of detailed practices for IT Service Management, ITIL consist of the following set of recommendation:

1. ITIL Service Strategy: understands organizational objectives and customer needs.

2. ITIL Service Design: turns the service strategy into a plan for delivering the business objectives.
3. ITIL Service Transition: develops and improves capabilities for introducing new services into supported environments.
4. ITIL Service Operation: manages services in supported environments.
5. ITIL Continual Service Improvement: achieves services incremental and large-scale improvements.

IT Service Operation have important role in service lifecycle. It is through the service operation lifecycle stage that the business directly sees and receives value from its IT investments (OGC, 2011). IT Service Desk is one of the four main functions in IT Operation and work together to deliver IT services along with Technical management, IT Operation Management, and Application Management. As part of the overall business, service operation is responsible for:

1. Delivering services efficiently at acceptable cost
2. Delivering services within prescribed service levels
3. Maintaining user satisfaction with IT services.

The Execution of ITSM processes in an organization, especially those processes that are more workflow-driven ones, can benefit significantly from being supported with specialized software tools. (Brenner, 2006). ITSM tools are often marketed as ITSM suites, which support not one, but a whole set of ITSM processes. At their core is usually a workflow management system for handling incidents, service requests, problems and changes. The ability of these suites to enable easy linking between incident, service request, problem and change records with each other and with records of configuration items from the CMDB, can be a great advantage.

A typical deployment of ITSM Tools will implement the following process:

a. Incident Management
b. Problem Management
c. Service Request Management
d. Service Level Management
e. Asset Management
f. Knowledge Management

The logical architecture for this application is shown in Figure 2.5. The Remedy database store huge volume of valuable information related to the life cycle of the Incident and Request from users. It contains the timestamp of each process and other information such as Operation Category and work duration of Service Desk.

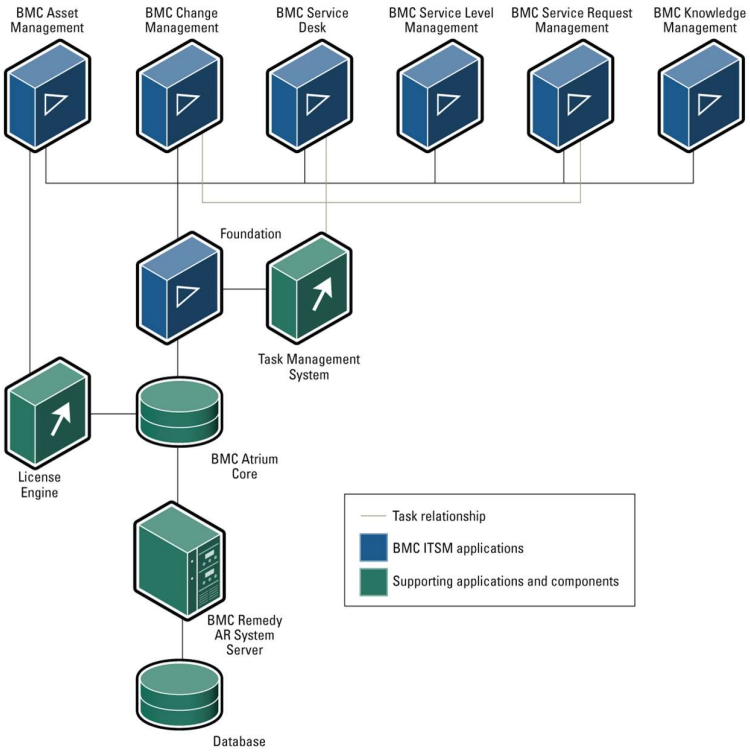

Figure 2.5 IT Architecture of BMC Remedy ITSM Tools (BMC, 2018).

Due to limitation of reporting capability of the Remedy Tools, it will be difficult to obtain the information to measure Service Desk workload and performance. Data analytic tools can be useful to extract information for huge volume of data to help improve decision making (HaloBI, 2018). Data analytic has been used in recent years to gather insight from operational data. Different type of data analytics that has been develop are as follow:

1. Descriptive Analytics, which use data aggregation and data mining to provide insight into the past and answer: “What has happened?”. Descriptive statistics are useful to show things like, total stock in inventory, average dollars spent per customer and year over year change in sales.

2. Predictive Analytics, which use statistical models and forecasts techniques to understand the future and answer: “What could happen?”. it combines historical data found in Enterprise Resource Planning (ERP), Customer Relation Management (CRM), Human Resource (HR) and Point of Sales (POS) systems to identify patterns in the data and apply statistical models and algorithms to capture relationships between various data sets.
3. Prescriptive Analytics, which use optimization and simulation algorithms to advice on possible outcomes and answer: “What should we do?”. Prescriptive analytics use a combination of techniques and tools such as business rules, algorithms, machine learning and computational modelling procedures.

Descriptive analytic can be used to understand what happened in the past, which is in the context of this research to aggregate all performance data of Service Desk and obtain information for further analysis such as ticket handling time, volume, and Service Desk work load distribution. The conceptual diagram for Data Analytic for Service Desk workload is described in Figure 2.6.

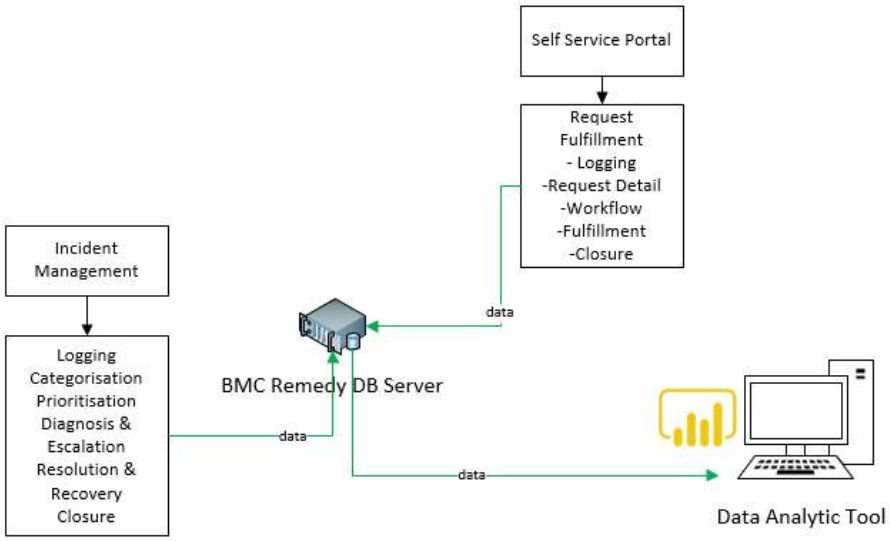

Figure 2.6 Conceptual diagram for Data Analytic of Service Desk Workload

2.7. Previous Research

There are some researches related to workload analysis that is relevant as the basis for this research, for example:

1. Research conducted by (Rahman, et.al, 2016) on workload analysis of security team in ITS using work sampling, traffic data and simulation using ARENA software and find that with one less personnel, the security level is still kept at 90%.
2. Research conducted by (Dheny, 2014) on workload analysis on Inspection for an oil company which is able to resolve bottlenecking issues and leveling of activity and reduce cost.
3. Research conducted by (Singgih et.al, 2008) on workload analysis of worker in General and Logistic Department of Printing Company which use leveling of workload.
4. Research conducted by (Gustomo et. al, 2006) and (Hutagalung et. al, 2013) on workload analysis of a Toll road company using Work Sampling method.

This research is part of numerous workload analysis to improve and optimize work load distribution that has been applied in various scientific disciplines and field of application. This thesis attempts to formulate time study based on historical data that is available in database. Due to large amount of data in the ITSM Tools database, data analytics tools are used to obtain information to understand workload of Service Desk to aggregate time and performance metrics of current Service Desk performance. Elemental data related to Service Call Center will be gather from Automatic Call Distribution (ACD) and used to calculate optimal number of Service Desk Call Center.

CHAPTER 3
THESIS METHODOLOGY

Thesis methodology is structural steps for performing the research in order to be focus for achieving the objective. Figure 3.1 shows in detail a workflow of the thesis methodology. The reader will be able to understand the process of this research. The basic steps of this thesis are as follow:

A. Field study and problem identification
B. Literature review
C. Problem statement and research objective
D. Data collection
E. Data analysis
F. Establish conclusion and recommendation

3.1. Field Study and Problem Identification

Field study is performed by performing interview with PT. X management and key users to gather business requirement and perform study of the related system. The problem is identified from current PT. X objective to optimize the cost on every line of business including in IT Division especially during contract renewal by reviewing existing contract scheme and to perform optimization of cost. Currently the contract scheme is based on the fixed number of resource and it has not been reviewed since 2012. Following discussion with PT. X management, some issues are identified i.e imbalance of workload among Service Desk resources, and high SLA achievement of Service Desk above target of 85%.

3.2. Literature Review

In order to have scientific theoretical background, the thesis requires some references related to the topic. Workload Analysis and Service Desk Operation theories are obtained from text book, journal, international standard and previous thesis.

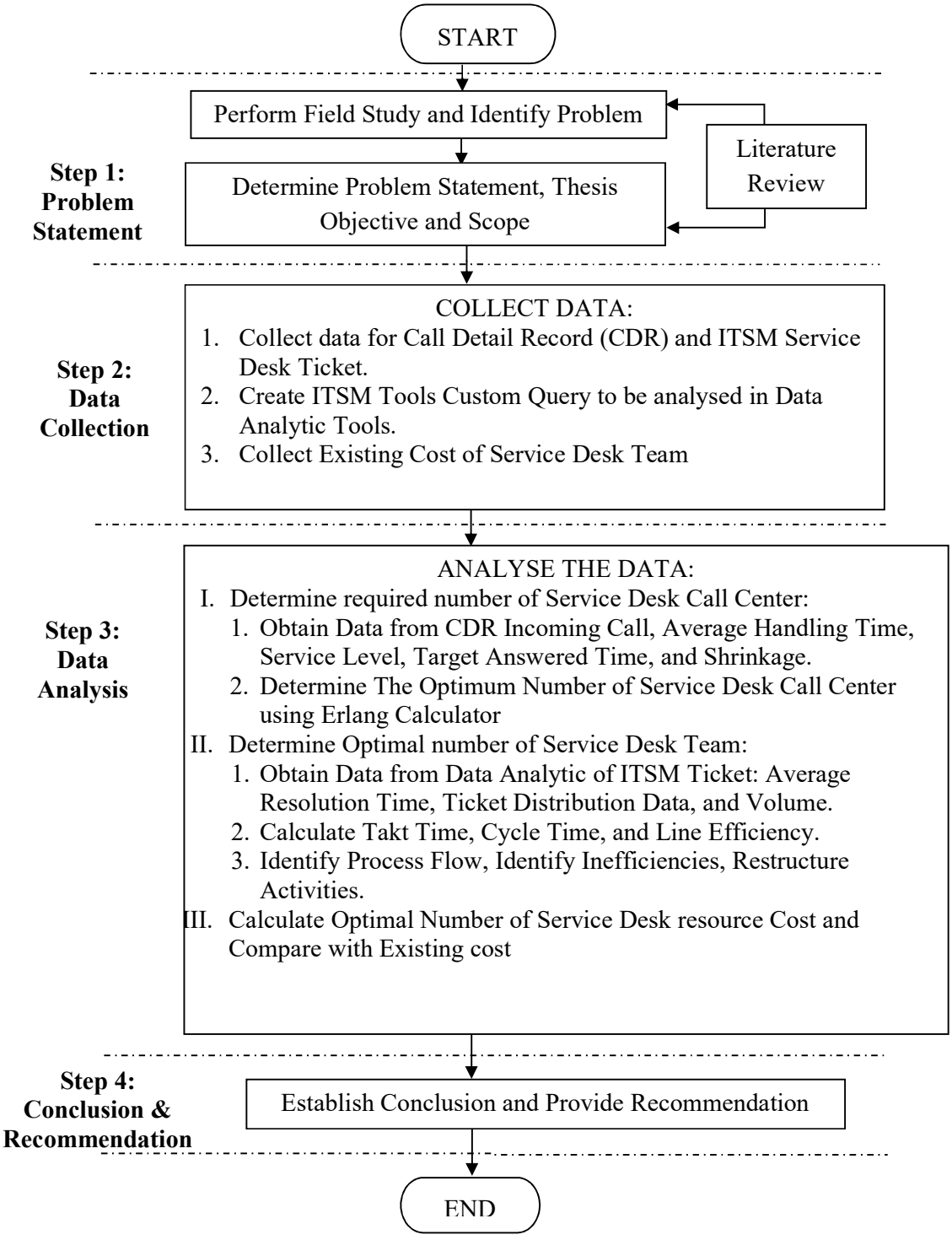

Figure 3.1 Workflow of thesis methodology

3.3. Determine Problem Statement and Thesis Objective

After performing the field study, identify problem and literature review, the next step is determining the problem statement, thesis objective which are going to be achieved and its scope. Currently, there is no analysis related to workload of Service Desk. Although the contract is renewed every 3 three years, there is no attempt to review the contract scheme or understand the workload distribution of Service Desk while at the same time the company has evolved and perform many changes to adapt to business environment. The historical data of IT Service Management Tools has not been used for any analysis including workload analysis of Service Desk. Current contract scheme which is based on fix number resource allocation will not be optimal if the workload required by the company is reduced or the workload distribution is not balanced among Service Desk personnel. Following a decreasing trend of oil and gas prices, PT. X perform cost reduction program by still maintaining the performance of support operation. The workload of Service Desk is analyzed to determine optimal number of resources in order to minimize total cost of service in the next contract.

3.4. Data Collection

The data required for determining the optimal number of resources are as follow:

1. Existing Service Desk workload required by the company. Workload of Service Desk can be translated to number of user call and ticket created by Service Desk Call Center and ticket closed by each Service Desk resource.
2. Number of user calls are obtained from Call Detail Record (CDR) from Automatic Call Distribution (ACD) from the company system which is based on Cisco Unified Call Center Express (UCCX).
3. Number of Service Desk ticket and resolution time are obtained from ITSM tools database (BMC Remedy v9). Since the built-in reporting function is quite limited, a custom query is built to get detailed data to be used in Data Analytic Tools using Power BI. Data aggregation can be easily perfomed using Data Analytic tools to get insight from historical data. Power BI is chosen as the tool

of choice as it is available in the company and offer simplicity and powerful data visualization.

4. Both Call Detail Record and ITSM Tools Data can be consider as the source of Indirect Time Study as elemental data that can be used for workload analysis. These data are analyzed during period between January 2018 to May 2018. This period is selected as the ITSM Tools is migrated to new system to support transition of ownership of PT. X since 1st January 2018.
5. The Service Desk cost is obtained from current contract renumeration. The new unit cost of Service Desk refers to Ikatan Nasional Konsultan Indonesia (INKINDO) billing rates as it is the new standard used by the company.

3.5. Data Analysis

Data analysis is conducted in order to achieve the objective of this thesis i.e. to determine the optimal number of Service Desk to minimize overall cost. The collected data will be analyzed as follow:

a. Required parameter to calculate the number of Service Desk Call Center will be extracted from Call Detail Record, which consist of Number of calls, and Average Handling Time (AHT). Target Answer Time and required service level are obtained from company requirement.
b. Due to variety of ticket Operational Category, a practical approach should be taken by assuming that response time and resolution time is homogenous for certain service category. Service Desk personnel should have the same skills required to process all incoming ticket. Delay to external factor such as waiting for user availability, unavailability of server or service is not considered in the calculation as it is beyond the perimeter of Service Desk.
c. Ticket Handling time is calculated as average from Data Analytic Tools by performing cleansing to outliers, example of outliers is ticket created and closed at the same time for record purpose.
d. The existing Service Desk cost will be compared to new optimal resource allocation using personnel unit cost from INKINDO.

3.6. Conclusion and Recommendation

This step informs the summary of the overall result on this thesis and provide recommendation regarding optimal resource allocation to PT. X for implementation on next contract renewal or further study.

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CHAPTER 4
DATA ANALYSIS

4.1. Data Collection

Based on the extraction of Call Detail Record, during the period of January to May 2018, there are total of 23,632 user calls to Service Desk Call Center with an average of 18.64% in abandoned status. Detail of Service Desk calls volume is given in Table 4.1.

Table 4.1 Monthly Statistic of Service Desk Calls

Month	Call Center ID	Calls Presented	Calls Abandoned	Calls Abandoned Rate
Jan-18	Helpdesk	6793	1891	27.84%
Feb-18	Helpdesk	4066	538	13.23%
Mar-18	Helpdesk	4760	705	14.81%
Apr-18	Helpdesk	4562	602	13.20%
May-18	Helpdesk	3451	668	19.36%
Average		**4727**	**881**	**18.64%**

Data extraction is performed from ITSM Tools database during the same period from January to May 2018. There are 10,439 ITSM ticket handled by Service Desk team. Detail of number of Service Desk ITSM ticket is given in Table 4.2.

Table 4.2 Monthly Statistic of Service Desk ticket

Service Desk Group	201801	201802	201803	201804	201805	Grand Total	Average Ticket Per Month (a)	Average Ticket Per Day (b)= a/22
SD-BPN-Admin	4	8	7	5	3	27	6	1
SD-BPN-CallCenter	67	35	24	34	34	194	39	2
SD-BPN-Intervention	1247	688	807	808	1006	4556	912	42
SD-BPN-Supervision	326	273	271	397	488	1755	351	16
SD-BPN-Supervisor				2		2	1	1
SD-BPN-VCON	131	157	163	216	182	849	170	8
SD-CPU-Intervention	21	18	43	38	61	181	37	2
SD-HDL-Intervention	275	155	188	126	134	878	176	8
SD-JHO-Intervention	234	156	172	219	221	1002	201	10
SD-JHO-VCON	86	56	63	42	22	269	54	3
SD-NPU-Intervention	8	20	9	31	11	79	16	1
SD-SNP-Intervention	47	32	70	76	30	255	51	3
SD-SPU-Intervention	75	102	89	69	57	392	79	4
Grand Total	2521	1700	1906	2063	2249	10439	2093	101

4.2. Data Analysis for Call Data Record

Before finding the required data for workload analysis, preliminary data interpretation from Table 4.1 and Table 4.2 are necessary to understand the context of operation in PT. X. the data analysis are as follows:

1. Refer to Table 4.1, the highest number of Service Desk calls occurred in January 2018, which is in line with the number of Service Desk ticket which reach the highest in January 2018 as shown in Table 4.2 (2,521 ITSM ticket). This is due to the migration process for IT System during transition of PT. X to new company.
2. Refer to Table 4.1, call abandonment rate in January 2018 is the highest (27.84%). This is due to system unavailability of Call Center system which cause Integrated Voice Recording system error and produce high abandoned calls. This information should be considered when calculating the volume of work for Call Center by omitting data from January 2018.

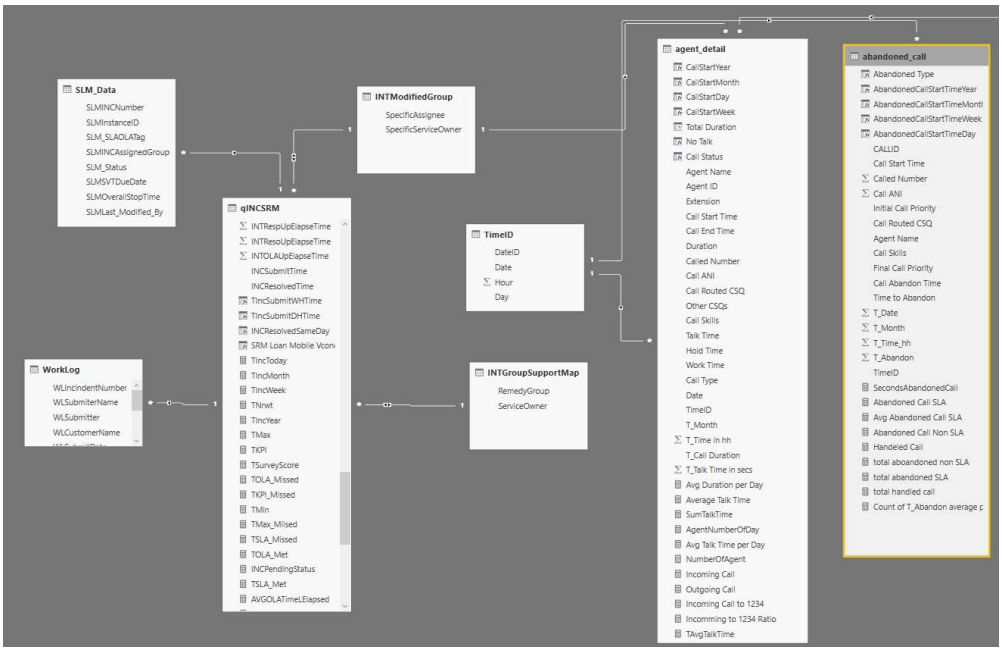

Figure 4.1 Model relationship in Data Analytic Tools

4.3. Creating Model for Data Analytic

Data gathered form the CDR and ITSM system is loaded into Data Analytics Tools for further analysis. The first step is to create a relationship model between the following data:

1. Call Detail Record consist of Agent Detail Call Table and Abandon Call Table.
2. ITSM ticket consist of ITSM Data Table.

Both data are linked with timeseries ID to aggregate the information based on time unit. The model can be seen in Figure 4.1. The console for data analysis can be found in Appendix A with detail custom SQL query available in Appendix D.

4.4. Determining Optimal Number of Service Desk Call Center

Erlang Formula can be used to determine optimal number of Service Desk Call Center provided that the call arrival data is tested whether it fits with Erlang Distribution using Kolmogorov-Smirnov (K-S) Goodness Of Fit (GOF) test. K-S test (D) is determined based on equation (2.9) by using EasyFit Software. Null hypothesis is the distribution represents the data if D < Dcritical at chosen significance level (α=0.05). $D_{critical}$ is obtained from K-S table in the statistical handbook. Based on Table 4.3, Call arrival data has $D < D_{critical}$ at chosen significance level (α=0.05). It means that Erlang distribution fit with the data. The significance level (α) is set at 5% for general industry. Figure 4.2 represent Probability Density Function of Call Center data and Goodness Of Fit to Erlang distribution. Data for Average Handling Time is available in Appendix B.

Table 4.3 Fitting Call Arrival data distribution

No	Component	Distribution	TTF		Remark
			D	$D_{critical}$	
1	Call Arrival Rate	Erlang	0.2	0.2332	Fail to reject H_0
2	Average Handling Time	Erlang	0.2	0.20399	Fail to reject H_0

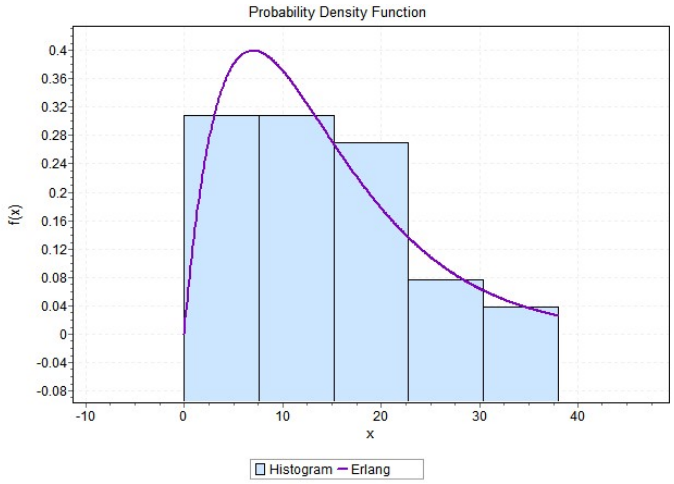

Figure 4.2 Probability Density Function of Call Arrival

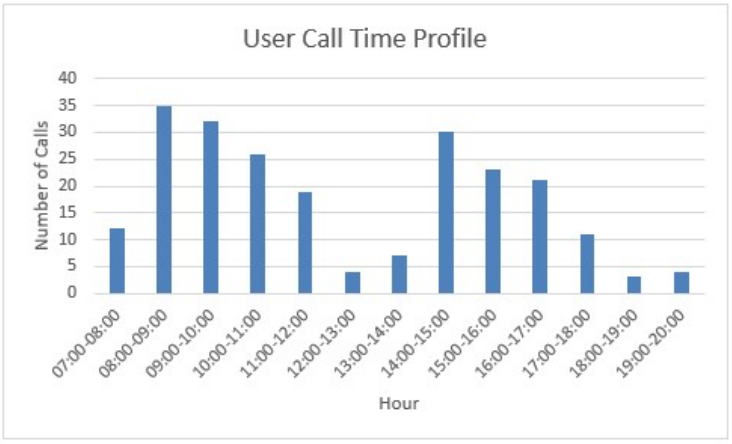

Figure 4.3 User Calls Time Profile

Data gathered form the CDR is further analyzed in Data Analytics Tool to find required parameter to calculate number of Call Center agent based on Erlang Formula such as number of calls per hour period as in Figure 4.3, Average Talk Time is 63 seconds. Average Handling Time is around 2 minutes which is obtained from observation. Refer to Figure 4.3, the arrival of user calling to Service Desk Call Center is not homogenous across the time period. Therefore, the number of Service Desk Call Center agent should adapt to this pattern. This is not the case

with existing practice in PT. X which allocate fixed number of Service Desk Call Center agent.

Based on Erlang Calculation result in Appendix C, the number of Service Desk Call Center agents is shown in Figure 4.4. Five Call Center agents are required during the period of 08:00-10:00 and 14:00-15:00. Therefore, current Service Desk call center agent need to be added from existing 4 persons during these periods.

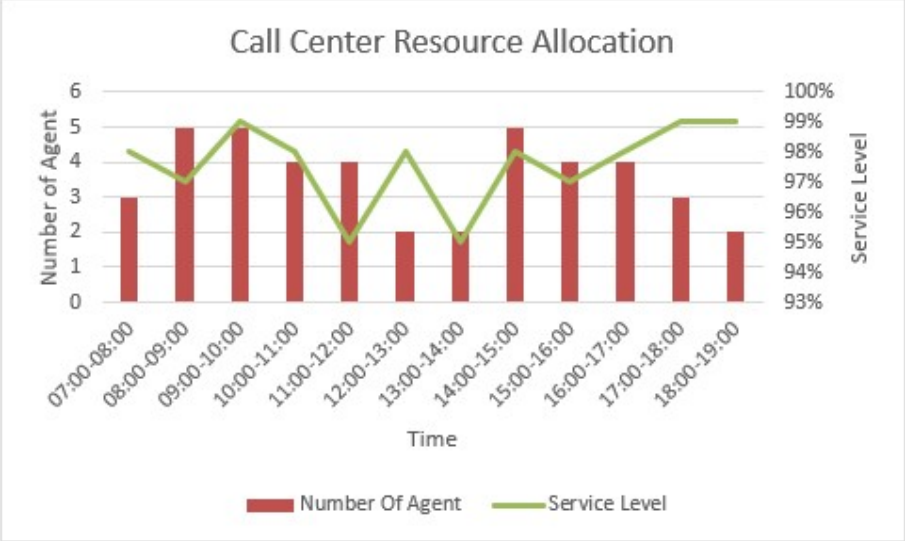

Figure 4.4 Call Center resource allocation per work hour

4.5. Determining Optimal Number of Service Desk Team

Optimal number of resources of Service Desk can be found by following steps as described in chapter 2.3 as follows:

1. Calculate Takt Time

   Based on interview with PT. X management, PT. X estimate 5% of users will call Service Desk every day and 60% of calls will transform into ticket to be followed up by Service Desk. Takt time can be calculated from equation (2.4). Refer to Table 4.3, the required throughput for Service Desk Call Center is 2 minutes/call and 3 minute/ticket for Service Desk.

2. Create Process chart to draw relationship and the sequencing between different activities in a process.

PT. X use simplified Service Desk process chart as shown in Figure 4.5.

Table 4.4 Takt Time Calculation

Service Metric	Description	Service Desk Call Center (calls)	Service Desk (ticket)
Number of Users	Number of IT users of PTX	3,914	3,914
Loading Factor	User population having issues per day	**5.00%**	
Screening Factor	Call transform to ticket and handled by Service Desk		**60%**
Number of User Calls/Ticket per Day	Daily Average Number of Call/Ticket	196	118
Normal Working Time	Daily Work Hours (hour)	8	8
Allowance/Shrinkage	Lunch, break, personal needs	2	2
Available Working Time	Available working time (minutes)	360	360
Takt Time	Throughput (minutes per ticket)	**2**	**3**

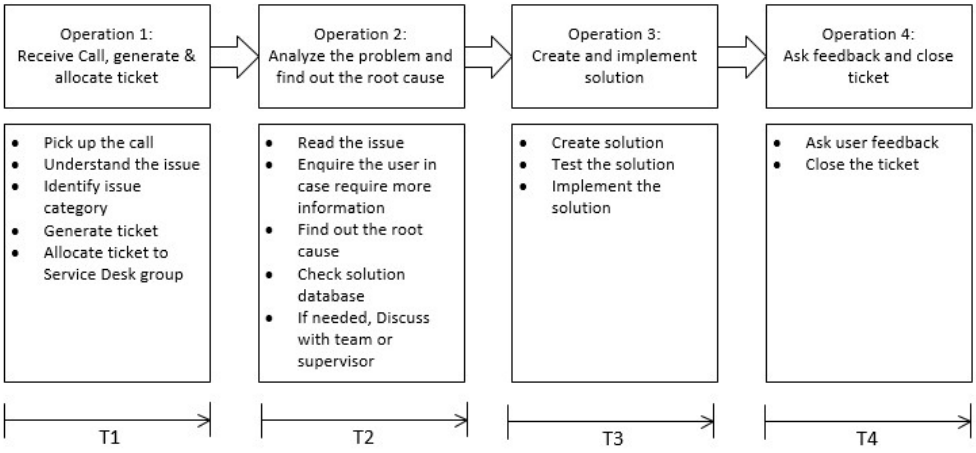

Figure 4.5 Service Desk Process Chart

3. Calculate time required for activities

   Refer to Figure 4.5, the required time for activities consist of the following:

   a. Time required by Service Desk Call Center to receive call and create ITSM ticket (T1).

      This data can be obtained from Data Analytic Tools by finding the average time for each call as shown in Table 4.5. This data needs to add wrap-up time or average handling time for Service Desk Call Center to create a ticket and assign to Service Desk team. Based on information from PT. X management, the wrap up time is set for 2 minutes. Therefore, Service Desk Call Center will need around 3 (three) minutes to receive a call, create a ticket and assign to Service Desk team. However, based on calculation of

Service Desk Call Center in sub chapter 4.4, the number should consider call arrival pattern which may vary during the day.

Table 4.5 Average Call Duration for Service Desk Call Center

Month	Average Call Duration (seconds)	Average Call Duration (minutes)
Jan-18	64	**1.07**
Feb-18	54	**0.90**
Mar-18	55	**0.92**
Apr-18	59	**0.98**
May-18	52	**0.87**
	Maximum	**1.07**
	Wrap Up Time	**2.00**
	Total Time	**3.07**
	Number of Resource	4
	Cycle Time	**0.77**

b. Time required by Service Desk team to analyze a ticket and identify the root cause (T2).

T2 is determined by feedback from End User Support team, service coordinator, and from direct observation. Based on the discussion, existing service desk has a typical time of 3 minutes to analyze and find the root cause of an incident. If a ticket takes more than 3 minutes to process, an escalation procedure will be initiated and the ticket will be put on hold.

c. Time required by Service Desk team to resolve a ticket (T3).

Service Desk Team need some time to the following activities:

1) Response a Ticket

The ticket created by Service Desk Call Center should be responded at certain duration (typically 1 hour) to respect SLA. The duration from ticket creation to first response is known as Response Time.

2) Provide Resolution

Service Desk team will respond and find the solution to close the ticket. the duration from response time to ticket closure is known as Resolution Time.

Response time and resolution time are defined by PT. X based on the service catalog agreed with the users. Since there are many groups in Service Desk Team, the ticket needs to be distributed among the Service Desk team. This data can be obtained from Data Analytic Tools by aggregating response time and resolution time for each Service Desk Team as shown in Table 4.6. The maximum time required to resolve a ticket is 40 minutes.

Due to large difference between Cycle Time of Service Desk Call Center (3 minutes), and Service Desk Team (40 minutes), The ticket will be queued if there is no available Service Desk Team to handle the request. Therefore, a certain number of Service Desk resources should be provided to satisfy the defined Takt Time in order to achieve a balanced line. Refer to Table 4.6, the maximum average resolve time is 40 minutes, and currently there are 24 persons available, hence the cycle time 1.67 Minutes.

Table 4.6 Resolve Time Service Desk vs Cycle Time

Service Desk Group	Number of Resource (a)	201801	201802	201803	201804	201805	Average Resolve Time (Minutes) (a)
SD-BPN-Admin	1	8	50	45	12	2	24
SD-BPN-CallCenter	4	4	6	4	15	4	7
SD-BPN-Intervention	5	57	39	29	30	38	39
SD-BPN-Supervision	2	14	17	12	15	21	16
SD-BPN-Supervisor	1				25		25
SD-BPN-VCON	2	26	31	37	36	29	32
SD-CPU-Intervention	1	42	5	7	5	9	14
SD-HDL-Intervention	1	11	8	9	8	10	10
SD-JHO-Intervention	3	31	47	32	52	37	40
SD-JHO-VCON	1	26	19	20	36	50	31
SD-NPU-Intervention	1	36	24	23	19	26	26
SD-SNP-Intervention	1	75	50	26	7	26	37
SD-SPU-Intervention	1	9	6	7	10	8	8
	24					Max Resolve Time	40
						CycleTime	**1.67**

d. Time required by Service Desk team to get user feedback and close the ticket (T4)

T4 is determined using the same method to find T2, and set for 1 minutes. This activity is performed by Service Desk Admin.

4. Measure Takt Time vs Cycle Time

The number of required workstations can use equation (2.5), where value of K is the empirical multiplying factor representing process inefficiency with value around 1.1 to 1.2 with Total Cycle Time for both of operations block equal to 2.69.

Number of workstation = (0.77+5+1.67+1) * 1.1 / 3 = 2.728

From the calculation, the process should not have more than 2 workstations. Figure 4.6 represent the graph of Cycle Time for each operation block. From the figure, it can be concluded that there are some idle resources available since cycle time is still below the required Takt Time for some operation block and only operation block 3 cycle time which has the same cycle time as Takt Time.

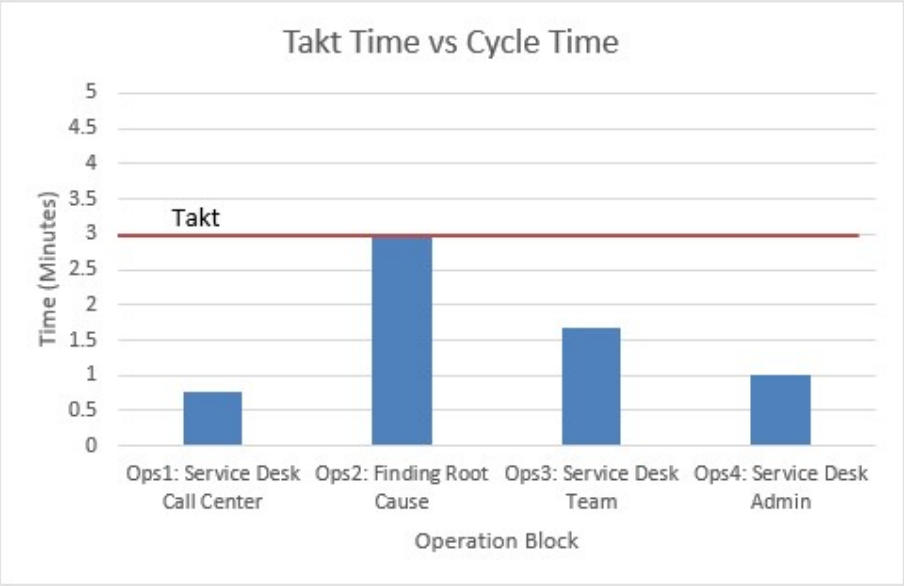

Figure 4.6 Takt Time vs Cycle Time for Service Desk Process Chart

5. Restructure Activities

   The results from previous step are discussed with management of PT. X, based the discussion the analysis are as follows:

   a. There are some imbalances of workload especially in operation block 2, as it take more time than other operation block.

b. Service Desk Call Center operation block cannot be combined as these operations have different resource requirement. Service Desk Call Center has less technical capabilities but they require good communication skills and the opposite for Service Desk team.

c. The restructuring activities should focus on reducing idle resources and to combine several operation blocks.

d. Further information related to resource allocation are obtained in Table 4.7. each of Service Desk group are assigned time allocation percentage to handle ITSM ticket from their available working time. From the calculation in Table 4.7, it is found that the average idle time for Service Desk team is 56%.

Table 4.7 Current Resource Allocation of Service Desk

Service Desk Group	Number of Resource (a)	Available Working Time (b)	Time Allocation Percentage (c)	Total Working Time On Ticket(minutes) (d) = a*b*c	Average Resolve Time (Minutes) (e)	Target Production Rate (ticket per day) (f) = d/e	Actual Production Rate per Day (g)	Percent Idle Time (h)=(f-g)/f
SD-BPN-Admin	1	360	20%	72	24	3	1	67%
SD-BPN-CallCenter	4	360	20%	288	7	42	2	95%
SD-BPN-Intervention	5	360	100%	1800	39	47	42	11%
SD-BPN-Supervision	2	360	60%	432	16	27	16	41%
SD-BPN-Supervisor	1	360	5%	18	25	1	1	0%
SD-BPN-VCON	2	360	50%	360	32	12	8	33%
SD-CPU-Intervention	1	360	50%	180	14	13	2	85%
SD-HDL-Intervention	1	360	50%	180	10	18	8	56%
SD-JHO-Intervention	3	360	100%	1080	40	27	10	63%
SD-JHO-VCON	1	360	50%	180	31	6	3	50%
SD-NPU-Intervention	1	360	50%	180	26	7	1	86%
SD-SNP-Intervention	1	360	50%	180	37	5	3	40%
SD-SPU-Intervention	1	360	50%	180	8	23	4	83%
Total	**24**			**5130**		231	101	**56%**

e. Several Service Desk groups need to be reorganized to reduce idle time. The recommended proposal is to consolidate Service Desk Intervention and to differentiate activities related to local proximity support and remote desktop support. The proximity support should be responsible to cover previous VCON support team and onsite support activity. The remote desktop support team should be able to process all the ticket regardless user location. Service Desk admin for Operation Block 4 can be combined with Service Desk Call Center function. Refer to Table 4.8, The number of resources is

reduced to 18 persons with idle time reduced to 7%. Some idle time is still needed to cover increase capacity requirement during peak hours.

Table 4.8 Proposal for Resource Allocation of Service Desk

Old Service Desk Group	New Service Desk Group	Number of Resource (a)	Available Working Time (b)	Time Allocation Percentage (c)	Total Working Time On Ticket(minutes) (d) = a*b*c	Average Resolve Time (Minutes) (e)	Target Production Rate (ticket per day) (f) = d/e	Projected Production Rate per Day (g)	Percent Idle Time (h)=(f-g)/f
SD-BPN-Supervisor	SD-BPN-Supervisor	1	360	5%	18	25	1	1	0%
SD-BPN-CallCenter	SD-BPN-CallCenter	5	360	5%	90	7	2	13	85%
SD-BPN-Intervention	SD-BPN-RemoteDesktop	2	360	100%	1980	40	70	50	-40%
SD-JHO-Intervention	SD-JHO-RemoteDesktop	1	360	100%					
SD-CPU-Intervention	SD-CPU-RemoteDesktop	1	360	50%					
SD-HDL-Intervention	SD-HDL-RemoteDesktop	1	360	50%					
SD-NPU-Intervention	SD-NPU-RemoteDesktop	1	360	50%					
SD-SNP-Intervention	SD-SNP-RemoteDesktop	1	360	50%					
SD-SPU-Intervention	SD-SPU-RemoteDesktop	1	360	50%					
SD-BPN-Supervision	SD-BPN-Supervision	2	360	60%	432	16	16	27	41%
SD-BPN-Admin	SD-BPN-Admin	0	360	20%	360	32	9	12	25%
SD-BPN-VCON	SD-BPN-ProximitySupport	2	360	50%					
SD-JHO-VCON	SD-JHO-ProximitySupport	1	360	50%	180	31	3	6	50%
Total	Total	**18**			**3042**		100	108	**7%**

6. Measure the Improvement

   Regrouping activities will impact to line efficiency as calculated using equation (2.6) with result as follows:

   Line efficiency = (Total cycle time)/ (2Number of workstations * Takt time)

   Line efficiency before balancing = 7.44 / (4*3) = 54%
   Line efficiency before balancing = 4.20 / (2*3) = 70%

   The impact after line balancing is shown in Figure 4.6, Operation Service Desk Team are still able to meet the required Takt Time even with reduced resource. For Service Desk Call Center, the cycle time does not represent the actual workload, due to the fact that the call arrival pattern is varied depending on the time and the calculation should use Erlang formula as described in sub chapter 4.4. In case the low hours, Service Desk Call Center should be able take the workload from Service Desk Team for certain type of ticket category.

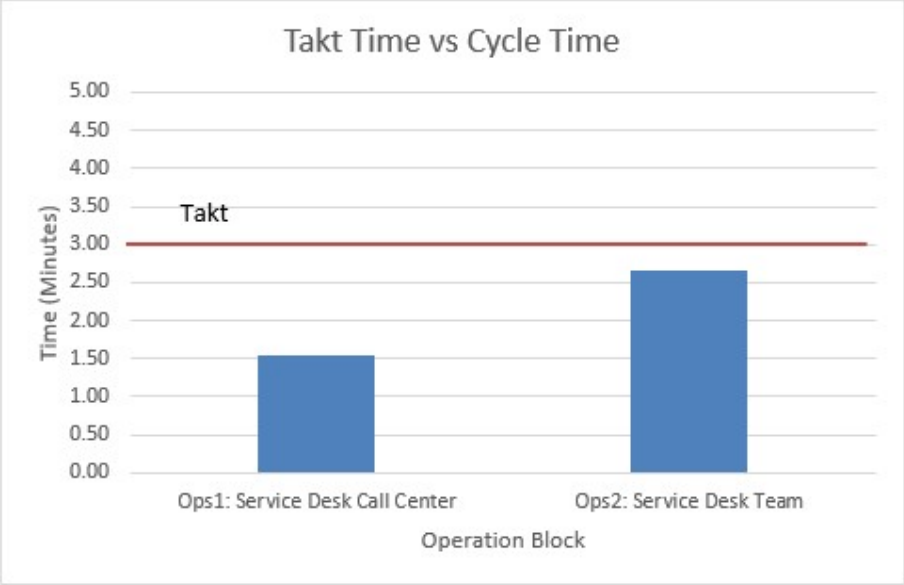

Figure 4.6 Impact on Cycle Time after Resource reallocation

4.6. Calculate Service Desk Cost

Comparison of cost calculation can be shown in Table 4.9. Cost of Service Desk with new resource allocation is estimated using reference from INKINDO billing rate. The cost estimation is based on personnel direct cost, and does not consider service desk outsourcing company margin as it will be decided during procurement process using owner estimates calculation with respect of budget approval.

Refer to Table 4.9, The cost of the Service Desk with the new resource allocation is reduced by 48% and reduce cost per ticket from IDR 238,976 to IDR 123,698. The impact on the service desk metric can be found in Table 4.10. The reduced resource will also impact on Service Desk productivity by 33%. Service Desk Team can process 1,395 ticket per year as compared with 1,046 ticket per year using existing resource allocation.

Table 4.9 Cost Comparison of Service Desk Resource

No	Existing Service Desk	Number of Resource	Yearly Cost (current)
1	Call Centre	4	IDR 743,395,018
2	Intervention Team JKT	3	IDR 641,346,077
3	Intervention Team BPN	5	IDR 1,058,632,146
4	Intervention Team Sites	10	IDR 1,999,638,498
5	VCON Standby BPN	2	IDR 423,452,858
6	VCON Standby JKT	1	IDR 199,963,850
7	Supervision and Monitoring	2	IDR 427,564,051
8	Admin Support	1	IDR 202,316,366
9	Service Desk Supervisor	1	IDR 305,827,064
		27	IDR 6,002,135,928

No	Proposed Service Desk	Number of Resource	Yearly Cost (proposed)
1	Call Center Service	5	IDR 621,000,000
2	Remote Desktop Support	2	IDR 248,400,000
3	Remote Desktop & Proximity Support Service SITES	10	IDR 1,458,000,000
4	Proximity Support BPN	2	IDR 248,400,000
5	Proximity Support JKT	1	IDR 124,200,000
6	IT Supervision Monitoring & Communication Service	2	IDR 248,400,000
7	Service Desk Supervisory Service	1	IDR 158,400,000
		23	IDR 3,106,800,000.00

Table 4.10 Comparison of Service Desk Metric

No	Service Desk Metric	Unit of Measurement	Qty	Current Resource Allocation	Proposed Resource Allocation	Difference
1	Average Number of User Call per Month		4,727			
2	Average Number of User Call per Year		56,724			
3	Average Number of ITSM Ticket Per Month		2,093			
4	Average Number of ITSM Ticket Per Year		25,116			
5	Service Desk Yearly Cost	IDR		6,002,135,928.36	3,106,800,000.00	-48%
6	Number of Service Desk Resource	Person		24	18	18
	Service Desk Metric/Ratio					
1	Yearly Number User Call per Per Service Desk Resource	Number of Call//Agent		2,363.50	3,151.33	33%
2	Number of Ticket Per Service Desk Resource	Number of Ticket/Agent		1,046.50	1,395.33	33%
3	Cost Per Call	IDR/Call		105,812.99	54,770.47	-48%
4	Cost Per Ticket	IDR/Ticket		238,976.59	123,698.04	-48%

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CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The conclusion of determining the optimal Service Desk resource allocation which has been discussed in the previous chapter are as follow:

1. Optimal Service Desk Call Center is found to be 5 persons to cover busy hours since the call arrival pattern is not the same during the day.
2. Optimal Service Desk Team is reduced from previously 20 persons to 14 persons. This is done by restructuring activities related to Service Desk intervention, VCON support team, and Service Desk administration to minimize idle time.
3. Service Desk resource should be grouped based on function rather than responsibilities fixed to a location in order to share the workload among the team. It will also be an advantage to improve Service Desk Call Center capability in order to increase First Call Resolution (FCR).
4. The optimal resource allocation results 48% of cost reduction per year and reduce cost per ticket from IDR 238,976 per ticket to IDR 123,698 per ticket.
5. This optimal resource allocation can be used as a baseline for the new contract.

5.2. Recommendation

After performing the research, the writer recommends to perform feasibility study to move certain Service Desk resources to off premise Service Desk solution such as Virtual Service Desk especially for Call Center and Remote Desktop Support to further optimize the cost. This feasibility study should uncover intangible cost that is not considered in this research such as office space requirement, electricity, and general IT cost.

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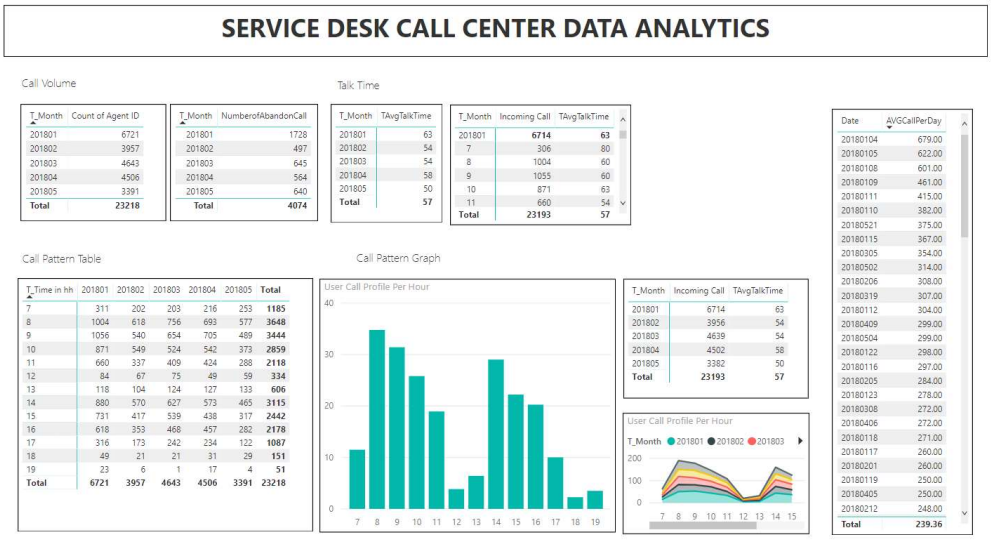
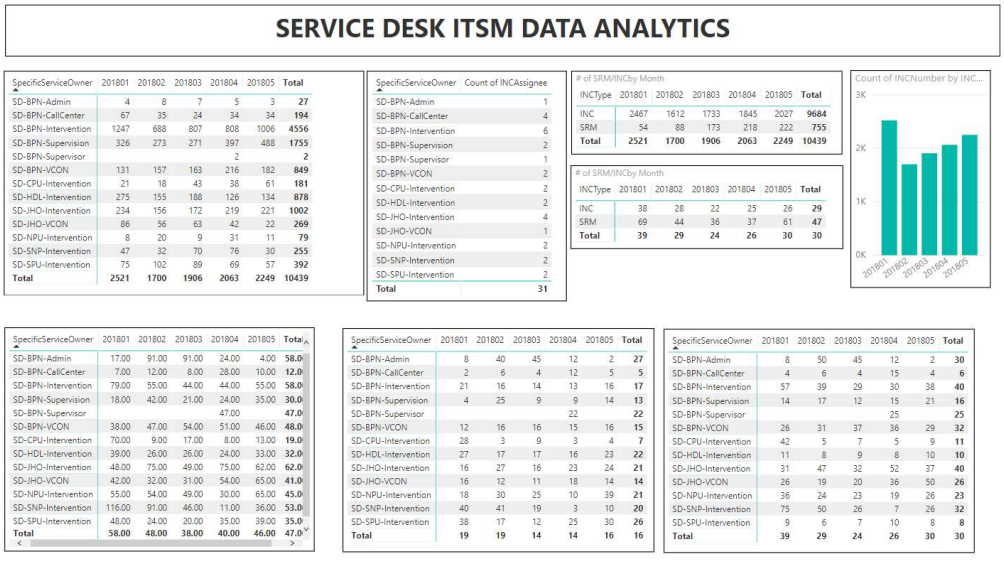
APPENDICES

A. Data Analytic Console





B. Average Call Handling Time Distribution

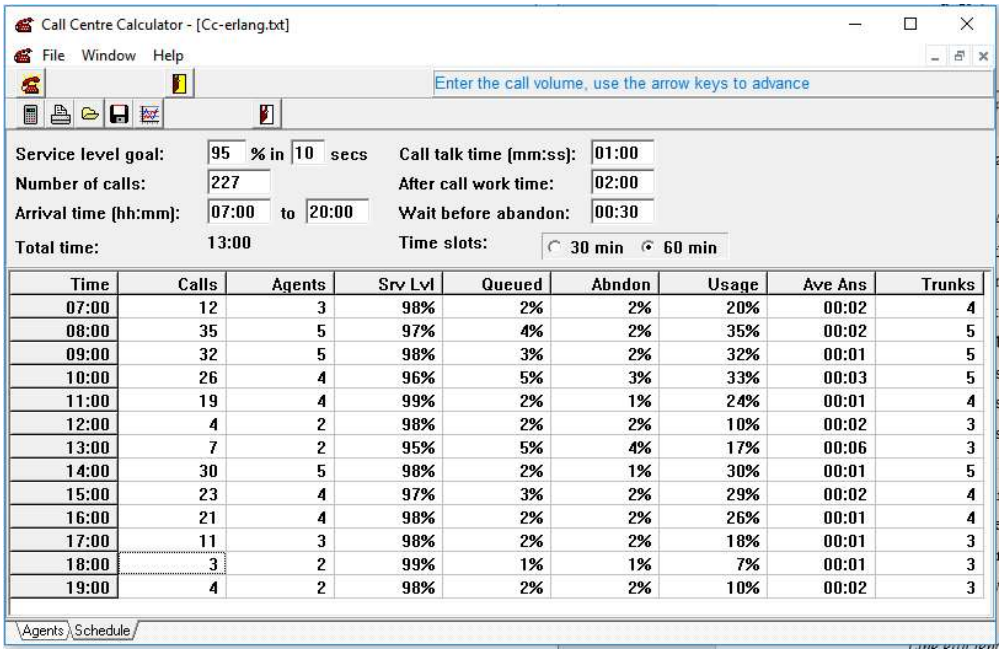
Average Handling Time	Number Of Calls
0	9754
1	9644
2	2481
3	847
4	385
5	191
6	104
7	74
8	44
9	29
10	18
11	17
12	6
13	7
14	5
15	9
16	4
17	2
18	1
19	1
20	2
21	1
22	2
25	2
28	1
38	1

C. Erlang Calculation

CALL CENTER ERLANG CALCULATION

Service Level Goal; 95%	**Talk Time: 60 seconds**
Call Answer in 9 seconds	**Wrap-up Time: 120 seconds**
Number of Calls: 227	**Average Handling Time: 120 seconds**
	Waiting Time: 30 seconds

Time of Day	Average Call Per Day	Number Of Agent	Service Level	Queued	Abandon Time	Average Answer Time
07:00-08:00	12	3	98%	2%	2%	2
08:00-09:00	35	5	97%	4%	2%	2
09:00-10:00	32	5	99%	3%	2%	1
10:00-11:00	26	4	98%	5%	3%	3
11:00-12:00	19	4	95%	2%	1%	1
12:00-13:00	4	2	98%	2%	2%	2
13:00-14:00	7	2	95%	5%	4%	6
14:00-15:00	30	5	98%	2%	1%	1
15:00-16:00	23	4	97%	3%	2%	2
16:00-17:00	21	4	98%	2%	2%	1
17:00-18:00	11	3	99%	2%	2%	1
18:00-19:00	3	2	99%	1%	1%	1



Time	Calls	Agents	Srv Lvl	Queued	Abndon	Usage	Ave Ans	Trunks
07:00	12	3	98%	2%	2%	20%	00:02	4
08:00	35	5	97%	4%	2%	35%	00:02	5
09:00	32	5	98%	3%	2%	32%	00:01	5
10:00	26	4	96%	5%	3%	33%	00:03	5
11:00	19	4	99%	2%	1%	24%	00:01	4
12:00	4	2	98%	2%	2%	10%	00:02	3
13:00	7	2	95%	5%	4%	17%	00:06	3
14:00	30	5	98%	2%	1%	30%	00:01	5
15:00	23	4	97%	3%	2%	29%	00:02	4
16:00	21	4	98%	2%	2%	26%	00:01	4
17:00	11	3	98%	2%	2%	18%	00:01	3
18:00	3	2	99%	1%	1%	7%	00:01	3
19:00	4	2	98%	2%	2%	10%	00:02	3

D. ITSM Custom Query

```
select
a.Incident_Number INCNumber,
a.InstanceId INCInstanceId,
a.Assigned_Group INCAssignedGroup,
a.Assignee INCAssignee,
a.First_Name + ' ' + a.Last_Name USERFullname,
a.Site USERSite,
a.Organization + '/' + a.Department USEREntity,
a.Organization USERDivision,
a.Department USERDepartment,
a.Categorization_Tier_1 INCCategorization_Tier_1,
a.Categorization_Tier_2 INCCategorization_Tier_2,
a.Categorization_Tier_3 INCCategorization_Tier_3,
a.Product_Categorization_Tier_1 INCProduct_Categorization_Tier_1,
a.Product_Categorization_Tier_1 INCProduct_Categorization_Tier_2,
a.Product_Categorization_Tier_3 INCProduct_Categorization_Tier_3,
a.Resolution_Category_Tier_2 INCReso_Category_Tier_2,
a.Resolution_Category_Tier_3 INCReso_Category_Tier_3,
a.Closure_Product_Category_Tier1 INCClosure_Product_Category_Tier_1,
a.Closure_Product_Category_Tier1 INCClosure_Product_Category_Tier_2,
a.Closure_Product_Category_Tier3 INCClosure_Product_Category_Tier_3,
a.Description INCDescription,
a.Detailed_Decription INCDetailed_Decription,
a.TEPI_SLA_Resp_Tag INCSLARespTag,
a.TEPI_SLA_Reso_Tag INCSLAResoTag,
a.TEPI_OLA_Reso_Tag INCOLAResoTag,
b.SVTTitle INCRespCat,
LEFT(b.UpTimeChar,8) as INCRespTimeLapse,
RIGHT('00'+CONVERT(varchar,FLOOR(b.GoalSchedGoalTime/86400)),2)+'                    '+
LEFT(CONVERT(varchar,DATEADD (ss,b.GoalSchedGoalTime % 86400,0),114),5) as
INCRespGoal,
c.SVTTitle INCResoCat,
LEFT(c.UpTimeChar,8) as INCResoTimeLapse,
RIGHT('00'+CONVERT(varchar,FLOOR(c.GoalSchedGoalTime/86400)),2)+'                    '+
LEFT(CONVERT(varchar,DATEADD (ss,c.GoalSchedGoalTime % 86400,0),114),5) as
INCResoGoal,
```

```
RIGHT('00'+CONVERT(varchar,FLOOR(c.DownElapsedTime/86400)),2)+' '+
LEFT(CONVERT(varchar,DATEADD (ss,c.DownElapsedTime % 86400,0),114),5) as
INCPendingTime,
RIGHT('00'+CONVERT(varchar,FLOOR((DATEDIFF(s,'1970-01-01 00:00:00',
GETUTCDATE())-c.Modified_Date+28800)/86400)),2)+' '+
LEFT(CONVERT(varchar,DATEADD (ss,(DATEDIFF(s,'1970-01-01 00:00:00',
GETUTCDATE())-c.Modified_Date+28800) % 86400,0),114),5) as INCPendingRunTime,
i.SVTTitle INCOLACat,
LEFT(i.UpTimeChar,8) as INCOLATimeLapse,
b.UpElapsedTime as INTRespUpElapseTime,
c.UpElapsedTime as INTResoUpElapseTime,
i.UpElapsedTime as INTOLAUpElapseTime,
RIGHT('00'+CONVERT(varchar,FLOOR(i.GoalSchedGoalTime/86400)),2)+' '+
LEFT(CONVERT(varchar,DATEADD (ss,i.GoalSchedGoalTime %86400,0),114),5) as
INCOLAGoal,
d.value as INCSLAstatus,
e.value as INCIncidentStatus,
f.value as INCSLARespTime,
f2.value as INCSLAResoTime,
f3.value as INCOLAResoTime,
left(a.TEPI_SLA_Resp_Tag,8) INCSLARespTag2,
left(a.TEPI_SLA_Reso_Tag,8) INCSLAResoTag2,
left(a.TEPI_OLA_Reso_Tag,8) INCOLAResoTag2,
a.SRID SRM_SRID,
g.Category_1 as SRM_NavigationalCategory_1,
g.Category_2 as SRM_NavigationalCategory_2,
g.Category_3 as SRM_NavigationalCategory_3,
g.Summary as SRM_Title,
CASE
        WHEN g.Category_1 = 'Default'
   THEN 'INC'
   ELSE 'SRM'
   END SRMORINCType,
DATEADD(ss, a.Submit_Date + 28800, '19700101') as INCSubmitDate,
CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19700101') ,112) INCSubmitSDate,
CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19700101') ,8) INCSubmitTime,
CASE
```

```
  WHEN DATEPART(ISO_WEEK, DATEADD(ss, a.Submit_Date + 28800, '19700101'))=53
AND MONTH(DATEADD(ss, a.Submit_Date + 28800, '19700101'))=1
    THEN LEFT(CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19690101')
,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss, a.Submit_Date +
28800, '19700101')) AS VARCHAR(2)),2)
  WHEN DATEPART(ISO_WEEK, DATEADD(ss, a.Submit_Date + 28800, '19700101'))=52
AND MONTH(DATEADD(ss, a.Submit_Date + 28800, '19700101'))=1
    THEN LEFT(CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19690101')
,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss, a.Submit_Date +
28800, '19700101')) AS VARCHAR(2)),2)
  WHEN DATEPART(ISO_WEEK, DATEADD(ss, a.Submit_Date + 28800, '19700101'))=1
AND MONTH(DATEADD(ss, a.Submit_Date + 28800, '19700101'))=12
    THEN LEFT(CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19710101')
,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss, a.Submit_Date +
28800, '19700101')) AS VARCHAR(2)),2)
    ELSE LEFT(CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19700101')
,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss, a.Submit_Date +
28800, '19700101')) AS VARCHAR(2)),2)
   END INCSubmitWeek,
LEFT(CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19700101') ,112),6)
INCSubmitMonth,
LEFT(CONVERT(varchar, DATEADD(ss, a.Submit_Date + 28800, '19700101') ,112),4)
INCSubmitYear,
DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101') as INCLastResolvedDateDate,
CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'),112)
INCResolvedSDate,
CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'),8)
INCResolvedTime,
CASE
  WHEN DATEPART(ISO_WEEK, DATEADD(ss, a.Last_Resolved_Date + 28800,
'19700101'))=53 AND MONTH(DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'))=1
    THEN LEFT(CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800,
'19690101') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss,
a.Last_Resolved_Date + 28800, '19700101')) AS VARCHAR(2)),2)
  WHEN DATEPART(ISO_WEEK, DATEADD(ss, a.Last_Resolved_Date + 28800,
'19700101'))=52 AND MONTH(DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'))=1
```

```
    THEN LEFT(CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800,
'19690101') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss,
a.Last_Resolved_Date + 28800, '19700101')) AS VARCHAR(2)),2)
  WHEN DATEPART(ISO_WEEK, DATEADD(ss, a.Last_Resolved_Date + 28800,
'19700101'))=1 AND MONTH(DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'))=12
    THEN LEFT(CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800,
'19710101') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss,
a.Last_Resolved_Date + 28800, '19700101')) AS VARCHAR(2)),2)
    ELSE LEFT(CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800,
'19700101') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(ss,
a.Last_Resolved_Date + 28800, '19700101')) AS VARCHAR(2)),2)
  END INCResolvedWeek,
LEFT(CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'),112),6)
INCResolvedMonth,
LEFT(CONVERT(varchar, DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'),112),4)
INCResolvedYear,
CASE
  WHEN a.Last_Resolved_Date is not null
    THEN CONVERT(int, DATEADD(ss, a.Last_Resolved_Date + 28800, '19700101'),112)-
CONVERT(int, DATEADD(ss, a.Submit_Date + 28800, '19700101') ,112)
                END INCDayLapse,
CASE
  WHEN h.Last_Surveyed_Date is not null
    THEN 'Yes'
    ELSE 'No'
  END SURVEYReceived,
(h.Q1_1_10 + h.Q2_1_10 + h.Q3_1_10 + h.Q4_1_10)/4 as SURVEYAvgScore,
h.Case_Description SURVEYCase_Description,
h.Q1_1_10 SURVEYQ1Score,
h.Comment_1 SURVEYComment_1,
h.Q2_1_10 SURVEYQ2Score,
h.Comment_2 SURVEYComment_2,
h.Q3_1_10 SURVEYQ3Score,
h.Comment_3 SURVEYComment_3,
h.Q4_1_10 SURVEYQ4Score,
h.Comment_4 SURVEYComment_4,
h.Submitted_By SURVEYSubmitted_By,
h.First_Name + ' ' + h.Last_Name SURVEYFullname,
```

```
h.Organization SURVEYOrganisation,
h.Survey_e_Mail_Address SURVEYUserEmail,
h.Category_1 as SURVEYSRM_Cat1,
h.Category_2 as SURVEYSRM_Cat2,
DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') as SURVEYDate,
CONVERT(varchar, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ,112) SURVEYSDate,
CASE
    WHEN DATEPART(ISO_WEEK, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900'))=53 AND MONTH(DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900'))=1
        THEN LEFT(CONVERT(varchar, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1899') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ) AS VARCHAR(2)),2)
    WHEN DATEPART(ISO_WEEK, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900'))=52 AND MONTH(DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900'))=1
        THEN LEFT(CONVERT(varchar, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1899') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ) AS VARCHAR(2)),2)
    WHEN DATEPART(ISO_WEEK, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900'))=1 AND MONTH(DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900'))=12
        THEN LEFT(CONVERT(varchar, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1901') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ) AS VARCHAR(2)),2)
        ELSE LEFT(CONVERT(varchar, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ,112),4)+'W'+RIGHT('0'+CAST(DATEPART(ISO_WEEK, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ) AS VARCHAR(2)),2)
END SURVEYWeek,
LEFT(CONVERT(varchar, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ,112),6) SURVEYMonth,
LEFT(CONVERT(varchar, DATEADD(dd, h.Last_Surveyed_Date - 2415020.5, '1/1/1900') ,112),4) SURVEYYear
from ARSystem.dbo.HPD_Help_Desk a
left join ARSystem.dbo.SLM_Measurement b on a.InstanceId = b.ApplicationInstanceID AND b.deleted = 1 and (b.GoalTypes = 0 OR b.GoalTypes = 1) and b.SVTTitle LIKE 'SLA Response%' and b.MeasurementStatus != 8 and b.MeasurementStatus != 6 and b.MeasurementStatus != 0
inner join ARSystem.dbo.SLM_Measurement c on a.InstanceId = c.ApplicationInstanceID AND c.deleted = 1 and (c.GoalTypes = 0 OR c.GoalTypes = 1) and c.SVTTitle LIKE 'SLA Resolution%' and c.MeasurementStatus != 8 and c.MeasurementStatus != 6 and c.MeasurementStatus != 0
```

inner join ARSystem.dbo.SLM_Measurement i on a.InstanceId = i.ApplicationInstanceID AND i.deleted = 1 and (i.GoalTypes = 0 OR i.GoalTypes = 1) and i.SVTTitle LIKE 'OLA Resolution%' AND a.Assigned_Group = i.FieldContainingRecordAssignmen and i.MeasurementStatus != 8 and i.MeasurementStatus != 6 and i.MeasurementStatus != 0 and i.SVTDueDate IS NOT NULL

inner join ARSystem.dbo.field_enum_values d on a.SLM_Status = d.enumId and d.fieldId = 1000003009 and d.schemaId = 1447 and overlayGroup = 0

inner join ARSystem.dbo.field_enum_values e on a.Status = e.enumId and e.fieldId = 7 and e.schemaId = 1447

left join ARSystem.dbo.field_enum_values f on b.MeasurementStatus = f.enumId and f.fieldId = 300365100 and f.schemaId = 1292

left join ARSystem.dbo.field_enum_values f2 on c.MeasurementStatus = f2.enumId and f2.fieldId = 300365100 and f2.schemaId = 1292

left join ARSystem.dbo.field_enum_values f3 on i.MeasurementStatus = f3.enumId and f3.fieldId = 300365100 and f3.schemaId = 1292

left join ARSystem.dbo.SRM_Request g on a.SRID = g.Request_Number

left join ARSystem.dbo.SRM_SurveyRequest_Join h on h.Request_Number = a.SRID and h.Q1_1_10 != ''

WHERE a.Submit_Date >= 1420041600

BIOGRAPHY

Anggoro Sujatmiko

The writer was born at Cilacap, 25th May 1979. The writer has formal education in SMPN 1 Sidareja Cilacap, SMUN 1 Purwokerto and Bachelor Degree of Electrical Engineering Bandung Institute of Technology. During undergraduate study, the writer took on job training in PT. Indosat and Schlumberger and completed undergraduate final assignment with topics related to Audio Codecs using Sinusioidal Transform Coding. After graduated, the writer worked in PT Astra Honda Motor as IT Engineer and Total E&P Indonesia with an exposure to international assignment in Total S.A France as Coordinateur de Mobilite & Messagerie, as well as Chef du Projet for Service du Confiance in Total Global Service. The writer currently works in Pertamina Hulu Mahakam as Head of External Project and IT Study.