

## **Purchasing strategy to minimize financial losses for customer support division on aerospace industry company**

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### **Abstract**

The Customer Support at an aerospace industry company, is on division who handles after sales support to customers. The workload keeps getting bigger everyday due to the requirements of the customers to keep their aircraft at serviceable condition. They are facing big issues due to high number of Customer Complaints, identifying low Customer Satisfaction. This issue arise due to long delivery lead times and low quality of delivered materials. Currently, Customer Support is running around US\$ 20 million business per year, and targeted by the Board to achieve US\$ 100 million in the coming years. In order to change this situation, we identify the issue by using DMAIC method, and improvement shall be made, especially for the Purchasing Strategy, where it is one of the root cause indicating the low performance of Procurement in terms of supporting Customer Support.

**Keywords:** purchasing strategy; customer support

## INTRODUCTION

Aircraft Services is the Business Unit in an aerospace industry company – hereinafter referred as “the company”, which business portfolio is to provide Maintenance, Overhaul, Repair, Alteration and also for Spare Parts support. Customer Support Division, under Aircraft Services Business Unit, is responsible for after sales services, with Initial Spare and Ground Support Equipment Department - hereinafter referred as “ISP & GSE”, which will be main discussion in this journal), with detail responsible to supply Spare Parts, Tooling, and Ground Support Equipment, including repair, required by customers. ISP & GSE has yearly responsibility to deliver around US\$ 20 million of spare parts and services sales to customer. The main responsibility of ISP & GSE is to ensure customer satisfaction by giving support to the customers, which are as follow:

- Spare parts support, including Aircraft On Ground and Spare Exchange;
- Repair;
- Services; and
- Warranty of Spare Parts.

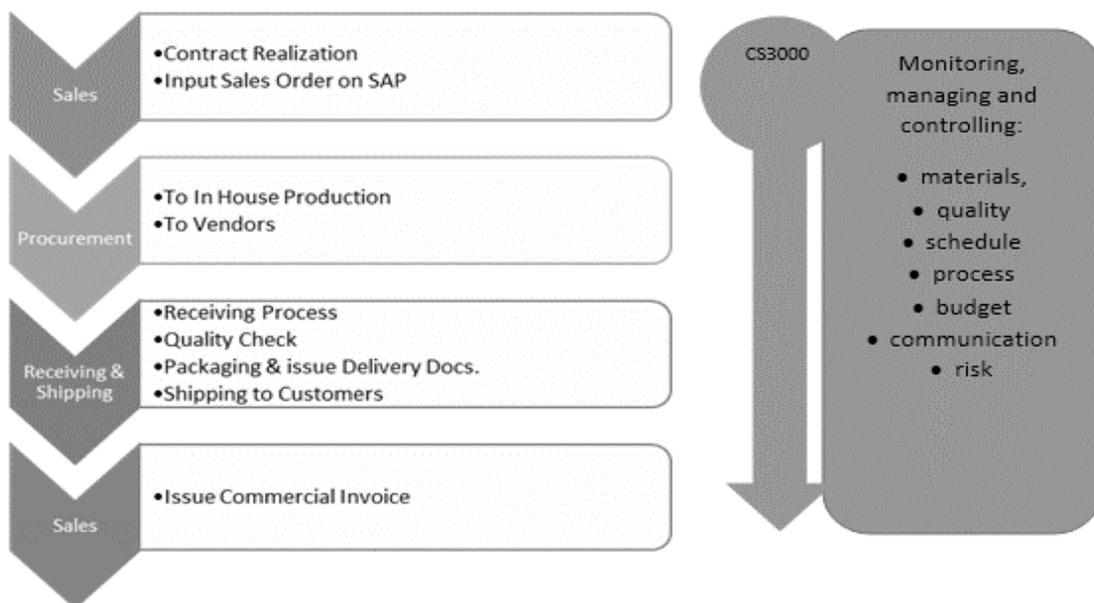
Currently, the programs running under ISP & GSE monitor are more than 17 (seventeen) programs, vary from local and international customers, and keep rising as the company deliver new aircrafts to customers.

ISP & GSE are currently having the main issue to maintain its business due to weakness in the company’s production, procurement, and supply chain, and in effect impacted the customer satisfaction and in the end of the process also the financial performance.

Prior to delivery of those spare parts to customers of the above programs, all materials are supplied to ISP & GSE by 2 (two) functions, first is from its in-house production and second is purchased from vendor through Procurement Division.

After all materials are finished and/or received, they will be collected in storage, and checked by ISP & GSE to ensure that the Part Numbers, quality (including documentation), and quantity are correct before requesting the Shipping Department to deliver those materials to the customers.

Brief business process for Spare Parts sales can be explained in the following chart:



Picture 1. Business Process for ISP & GSE

Source: data processed

The performance of ISP & GSE are measured mainly based on Quality, Cost, and Delivery. The biggest impact of customer complaints are for Delivery Lead Time and Quality of delivered items, which impacted to penalty and warranty claims from customers. Delay of delivery is a major issue, because it is impacted the operational schedule of customers. As for complaints regarding the quality

of materials delivered to the customers, are caused by physical defect and/or do not have the same fit, form, and function (3F) with the requirements, therefore these rejected materials cannot be used by the customers. Customers will issue penalty and warranty claims for these complaints, which at the end will impact financial performance of the company.

The recorded warranty claims received by ISP & GSE in 2017 are 114 warranty in total, showing the issue with the quality of the materials delivered to customers. These warranty claims must be resolved by ISP & GSE free of charge to customers, and ISP & GSE must bear the warranty cost. The costs occur will consist of the cost of repair and/or replace, man hour (if required), and transportation cost.

Other cost aside of warranty costs that must be bear by ISP & GSE is penalty from customers, whereas the value are different for each customer. We can see the comparison value of total sales, penalty, warranty, and average day delay in the following table:

Total Sales	\$	20,000,000.00
Total Penalty	\$	500,000.00
Total Warranty	\$	500,000.00
Average Day Delay		89 days

Source: company data

The goal of this journal is to give alternative solution to the business issue occur to ISP & GSE related to poor Customer Satisfaction and the cost they have to bear. In order to do this, we have to find and define the root cause of why this issue arise.

**METHOD**

The method to use within this journal to analyze the situation and find the root cause is the integral part of Six Sigma initiatives, which is Define, Measure, Analyze, Improve, and Control (DMAIC) method.



Picture 2. DMAI Methodology  
Source: data processed

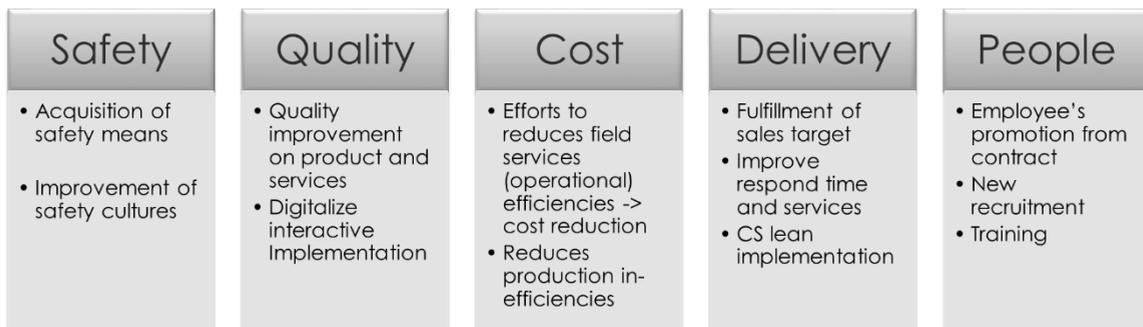
Define Phase - Customer Support has received many Customer Complaints in the recent years. Mainly, the complaints are related to delay delivery, which causing their operational activities to be delayed. With these Customer Complaints, the customer also apply the penalty and liquidated damage.

The amount of penalty in 2017 is US\$ 500,000.00 (five hundred thousand US Dollar), and the number of warranty claims is 114 items, with estimated cost US\$ 500,000.00 (five hundred thousand US Dollar).

These complaints are in effect have cost to be borne by ISP & GSE, which also impacted to financial performance, and also reduce the profit margin of the program. Average margin for Follow On Support program is 20-30%, which is considered as of the most profitable program in the company. Being reduced by these complaints is not satisfactory for ISP & GSE in terms of finance, and also considered inefficient and ineffective, due to it costs additional man power to be involved in this refinement.

Thus, in order to reach intended condition, we need to analyze what improvement we shall make on those areas (the root causes), what the proposed solution is, and what steps to take, and how we detailed the solutions in schedule.

Measure Phase - ISP & GSE has the several Quality Objectives to achieve, which are Safety, Quality, Cost, Delivery, and People. The Quality Objectives is detailed as follow:



Picture 3. Quality Objective for ISP & GSE  
Source: data processed

Those Quality Objectives is then breakdown to several Key Performance Indicators by the management to be fulfilled by ISP & GSE. Main Key Performance Indicators for ISP & GSE which will be discussed in this journal are Customer Satisfaction Index and On Time Delivery. Customer Satisfaction Index and On Time Delivery target and realization are shown in the following table:

Table 2. Target vs Realization Key Performance Indicator for ISP & GSE

Subject	Target	Realization
Customer Satisfaction Index	4 out of 5	2 out of 5
On Time Delivery	0 day delay	89 average day delay

Source: company data

The table above have shown that there are gaps between current condition and the intended condition, which mean there is room for us to make improvement.

## RESULTS AND DISCUSSION

Analyze Phase – Root Cause Analysis - In this journal, we will use The Cause Mapping Method to find the root cause of why the company is receiving many customer complaints from customers which impacted to high numbers of warranty claims and penalty. In order to solve the problem, we need the find the actual root cause first. If we do not find the actual root cause, then we are just working on a symptom, and the problem will return.

The main issue in this journal is why ISP & GSE (and the company in general) having received many Warranty Claims and Penalty as a result of poor performance of its after sales where in the end resulted in Customer Complaints. By using The Cause Mapping Method, we can find the root cause as shown in the following diagram:



Picture 4. Cause Mapping Method Analysis  
Source: data processed

In conclusion after finding the root cause, we have to make improvement for Purchasing Strategy based on effective and efficient Supply Chain Management to solve Customer Satisfaction issue.

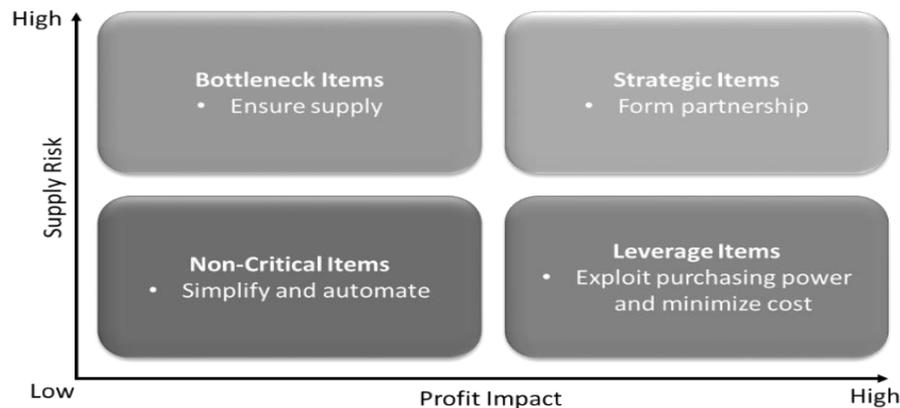
The impact of these problems can be seen in the Sales realization, Penalty, Warranty, and Day Delay below Table 1 above.

Improvement Phase - The existing process of selecting suppliers is performed by Procurement only based on the price quoted by the suppliers. Purchasing will issue Request For Quotations to suppliers which are already approved by Quality Assurance and listed in the Qualified Supplier List (QSL) document. 3 (three) suppliers, at least, are evaluated by the Purchasing after they submit the Quotation, and the one with the lowest price will be selected as the winner, and will be followed up by the Purchasing by issuing the Purchase Order, followed by others succeeding processes. In some cases, supplier with higher price might be selected also, in consideration of short lead time, with the policy of the higher level in Purchasing. The problem arise because Purchase Orders from customers contains many variant of products, and currently there no specific Purchasing Strategy to procure those materials.

Clearly, procuring materials for ISP & GSE, as the company’s appointed division for after sales, shall have an effective Procurement Strategy to accommodate the necessity to supply the required material to the customers. Different type of products will require a different type of procurement strategy. The goal of the improvement is to create paperless, effective and efficient Procurement Strategy to support ISP & GSE. Hereinafter, we will analyze and evaluate the applicable procurement strategy in relation to ISP & GSE.

### Kraljic’s Supply Matrix

As defined in the book *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies* : The Procurement Strategy shall depend on the type of products and the level of risk and uncertainty involved (Simchi-Levi, Kaminsky, & Simchi-Levi, 2007, p.286). According to Kraljic (1983), a firm’s supply strategy depends on two factors: (1) profit impact and (2) supply risk (Caniels & Gelderman, 2005, p.141). Supply risk “assessed in terms of availability, number of suppliers, competitive demand, make-or-buy opportunities, and storage risks and substitution opportunities.” (Simchi-Levi, Kaminsky, & Simchi-Levi, 2007, p.286). Those two factors are the basic to Kraljic’s supply matrix to form four quadrants as can be seen in Figure 5 below:



Picture 5. Kraljic's Supply Matrix

Source: data processed

Simchi-Levi, Kaminsky, & Simchi-Levi explain that the Kraljic's supply matrix above can be detailed as follow:

The top-right quadrant represents Strategic Items where supply risk and impact on profit are high. These are items that have the highest impact on customer experience and their price is a large portion of the system cost. These are also the components that typically have a single supplier. Clearly, the most appropriate supply strategy for these items is to focus on long-term partnerships with suppliers.

The bottom-right quadrant represents items with high impact on profit, but low supply risk, what Kraljic calls Leverage Items. These are the items that have many suppliers, and a small percentage of cost savings will have a large impact on the bottom line. Thus, focusing on cost reduction by, for example, forcing competition between suppliers is the appropriate procurement strategy.

The top-left quadrant represents high supply-risk but low-profit impact items. These components, referred to as bottleneck components, do not contribute to a large portion of product cost, but their supply is risky. Thus, unlike leverage items, in this case supplier have a power position. For these bottleneck items, continuous supply, even possibly at a premium cost, is important. This can be done through long-term contracts or by carrying stock (or both).

Finally, for non-critical items, the objective is to simplify and automate the procurement process as much as possible. In this case, a decentralized procurement policy is appropriate. (Simchi-Levi, Kaminsky, & Simchi-Levi, 2007, p.286)

The implication of the Kraljic's supply matrix is clear. Each one of the four product categories requires a different procurement strategy.

### Fisher's Supply Chain Framework

Marshall L. Fisher introduced the concept of functional and innovative products in his article "What is the Right Supply Chain for Your Products?" In the book of Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies, Fisher mentioned that a functional products are associated with slow product clockspeed, predictable demand, and low profit margins, while the innovative products are associated with fast product clockspeed, unpredictable demand, and high profit margins (Simchi-Levi, Kaminsky, & Simchi-Levi, 2007, P.289).

As observed by Fisher, the supply chain strategy that should be applied to innovative products are quite different than the supply chain strategy for functional products. The appropriate supply chain strategy for functional products is push, where the focus is on efficiency, cost reduction, and supply chain planning. On the other hand, the appropriate supply chain strategy for innovative products is pull, because of the high profit margins, fast clockspeed, and unpredictable demand. Indeed, the focus here is on responsiveness, maximizing service level, and order fulfillment (Simchi-Levi, Kaminsky, & Simchi-Levi, 2007, p.289).

### Combination of Kraljic's Supply Matrix and Fisher's Framework

As discussed above, the Kraljic's focuses on supply side, meanwhile Fisher's framework focuses on demand side. So, the combination of both will consist of 4 (four) criteria:

Component forecast accuracy

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Component supply risk  
 Component financial impact  
 Component clockspeed

Depending on the above criteria, the decision of the procurement strategy might be different. In order to identify the alternative strategies to be applied as the practicable purchasing strategy, he author conduct a Focus Group Discussion which is attended by Material Planner, Purchaser, International Sales, and Customer Support. Based on best practices and as also decided within the Focus Group Discussion, several possible strategies that might be taken after the evaluation of a component strategy by integrating the impact of these four criteria are:

Make or Buy  
 Long Term Contract  
 Strategic Partnership  
 Minimize Lead Time  
 Many Suppliers  
 Safety Stock

### **Purchasing Strategy**

Based on the aforementioned framework and methodology then we will try to integrate them into the company's current procurement condition, and see if can improve to reach intended condition.

In order to differentiate the purchasing strategy, we have to define the materials to be purchased in relation to Customer Support – CS3000 program, and put them to be purchased on several categories. Thereafter, the best and appropriate strategy will be identified for each category. Identification of categories and what appropriate strategy for each category are also conducted and decided within the Focus Group Discussion.

The result of Focus Group Discussion, starting from identifying categories and defining purchasing strategy is detailed as follow:

Class A items; are components with life limit, single source supplier, high cost, and long purchasing lead time. Components included in this category are engine, propeller, and landing gear.

Avionics, Electrical, and Instruments (AEI):

This category is related to Aircraft's systems, therefore identified as one category.

Avionics; are the electronic systems used on aircraft, which includes communications, navigation, the display and management of multiple systems, and hundreds of systems that are fitted to aircraft to perform individual actions. The cockpit of an aircraft is a typical location for avionic equipment, including control, monitoring, communication, navigation, weather, and anti-collision system (available at <https://en.wikipedia.org/wiki/Avionics>, accessed: 20 April 2018). Included in this category are Transceiver, Display, and Auto Pilot Computer.

Electrical; is a self-contained network of components that generate, transmit, distribute, utilize and store electrical energy, and an integral and essential component of all but the most simplistic of aircraft designs. Components in this category are Inverter, Starter Generator, and Alternator.

Instruments; are equipment of an aircraft at provide information about the flight situation of that aircraft, such as altitude, airspeed, and direction. They are to improve safety by allowing the pilot to fly the aircraft in level flight, make turns, without a reference outside the aircraft such as horizon (available at [https://en.wikipedia.org/wiki/Flight\\_instruments](https://en.wikipedia.org/wiki/Flight_instruments), accessed: 20 April 2018). Engine Indicator, Direction Indicator, Altitude Indicator are included in this category.

Structure; is the airframe of the aircraft. Structure is identified as a category because it is manufactured only by in house production, unless given the authorization to do otherwise. This category is included Fuselage, Wings, Stabilizers, Flight Control, and Landing Gear.

Standard Parts: Expendable parts, identified as a category because in many times causing bottleneck due to unavailability. Standard Parts is part or material that conforms to an established industry specification. Federal Aviation Administration (FAA) acceptance of a standard part of an approved part is based on the certification that the part has been designed and produced in accordance with an independent established set of specifications and criteria.

Consumables: Expendable parts, identified as a category because in many times causing bottleneck due to unavailability. Consumables is generally a bulk-type materials and have short life limit, such as Fuels, Lubricants, Paints, and Chemicals. Consumables are items used only once.

Next step is to analyze each category, and define the correct strategy for each category. The analysis of each category is as follow:

**Class A Category**

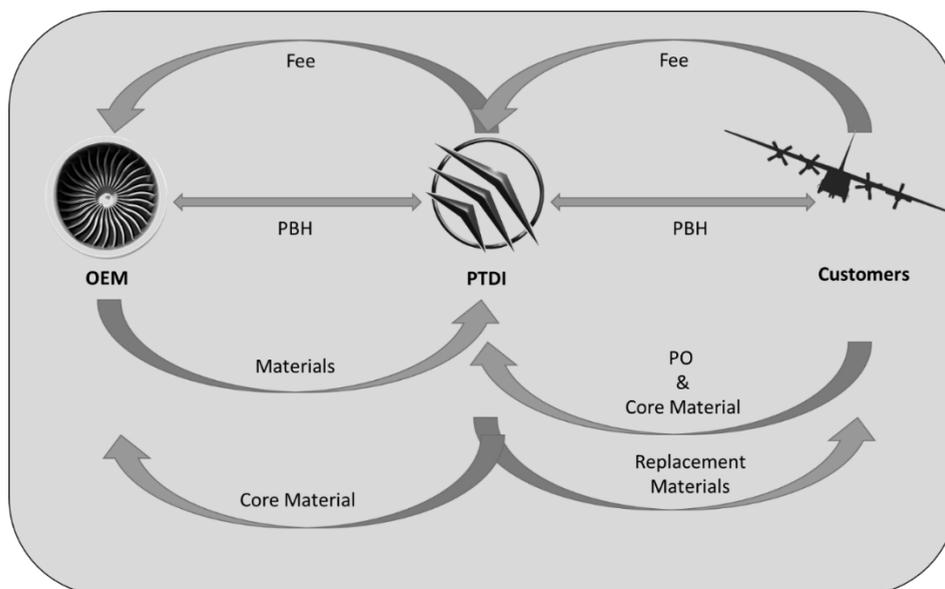
Table 3. Class A Items Category

Forecast Accuracy	High	Life limit and Scheduled Maintenance
Supply Risk	High	Single Source
Profit Impact	High	High Profit Margin
Clockspeed	Low	Slow Evolution

Source: data processed

The discussion at FGD has concluded the impact of each criteria and the purchasing strategy. Class A Category, has a high forecast accuracy because of life limit and scheduled maintenance, supply risk is high due to single source, profit margin is high, and technology evolution is low. The Purchasing Strategy for this category is to have Long Term Contract and / or Strategic Partnership. The objective of this category is to reduce procurement lead time, and therefore, the appropriate purchasing strategy for Class A items is to create Strategic Partnerships with suppliers (OEM). The goal of having the partnership with OEM is to provide materials on-time at site, and therefore to customers.

The recommendation of the application for this Strategic Partnership is to have Power By the Hour Program. This program is also used by Airbus Helicopters, and have the advantage of Budget Control, Availability of Material, and Time and Cost Saving. Once Customer Support receive Purchase Order the customers, these items might be directly delivered to customers within short lead time. This concept can be also applied as back to back program, where Customers have partnership with the company (in the concept of Power by the Hour), and the company to OEM. The scheme of proposed Power by the Hour is as follow:



Picture 6. Power By the Hour Concept  
Source: data processed

Partnership in form of Power by the Hour between the company and OEM, and between the company and customers.

Customers pay annual fee to the company, and the company pay annual fee to OEM. OEM will store materials at the company's site.

Customers require material, and issue Purchase Order to the company and deliver the core material to the company.

The company deliver the replacement material to Customer within 1 week to ensure serviceability, and the core material to OEM within the same lead time.

OEM will receive and deliver new material to be stored at the company's site.

**Avionics, Electrics, and Instruments Category**

Table 4. Avionics, Electrics, and Instruments Category

Forecast Accuracy	High	Life limit and Scheduled Maintenance
Supply Risk	Low	Many Suppliers
Profit Impact	High	High Profit Margin
Clockspeed	Low	Slow Evolution

Source: data processed

The discussion at FGD has concluded the impact of each criteria and the purchasing strategy for AEI category. AEI are items with high forecast accuracy, low supply risk due to availability of suppliers, the profit margin are high, and clockspeed is low. The proper strategy for this category is to force competition between the suppliers, to ensure supply, and to minimize the cost. This strategy is to force supplier to respond to the company's demands, and to compete one another. After evaluation of Quotations, the Purchase Order will go to the lowest price supplier. Aside of using many suppliers, the purchasing shall make effective contracts with penalties and implement accurate preplanning activities, in order to force the suppliers to maintain their cost, quality, and delivery competencies.

**Structure Category**

Table 5. Structure Category

Forecast Accuracy	Low	Demand based on Unpredictable Circumstances
Supply Risk	High	Dependence on Capacity
Profit Impact	High	High Profit Margin
Clockspeed	Low	Slow Evolution

Source: data processed

The discussion at FGD has concluded the impact of each criteria and the purchasing strategy for Structure category. In Structure category, most of the items sold to customers are assembly and sub-assembly products, thus, to reduce lead time and the dependence on internal capacity, the Make or Buy Decision is the appropriate strategy. Procuring from in house production might causes issues in relation to capacity and priority.

Before deciding to make or to buy, Purchasing shall evaluate the availability of the in house production capacity, and also the availability of the suppliers. Available suppliers shall be audited and then listed in company's Approved Supplier List. Accurate list of items to be outsourced, shall also be provided before deciding to outsource some activities to suppliers. In the event of outsource (buy), the company will disclose its data to its supplier, including engineering data and drawing. Therefore, to protect the company's key competencies, the assembly process shall be performed by in house production, and the manufacture and/or buy of break down parts can be outsourced and performed by the suppliers, with the lowest price and/or the shortest lead time, depend on the urgency of the material.

**Standard Parts Category**

Table 6. Standard Parts Category

Forecast Accuracy	High	High Usage due to Standardization
Supply Risk	Low	Many Suppliers
Profit Impact	Low	Low Profit Margin
Clockspeed	Low	Slow Evolution

Source: data processed

The discussion at FGD has concluded the impact of each criteria and the purchasing strategy for Standard Parts category. In Standard Parts category, the demand might be learned from historical data, so forecast accuracy is high. Supply risk, profit impact, and technology evolution are low, but without the required standard parts and/or consumables, can cause bottleneck in the production (repair and/or manufacture) process. Therefore, the FGD agreed that the appropriate strategy for this category is to have Safety Stock.

The items to be included as Safety Stock category can be defined based on the historical data from the past 3 years (might be extended further to 5 years, but due to Customer Support Division was

just established on 2015, therefore 3 year historical data will be valid). Then, we calculate the amount of inventory for those items using Fixed-Order Quantity Model. Material Planner shall monitor the inventory level and create Purchase Request (to be followed up by Purchaser to place Purchase Order) when the stock reaches the calculated minimum quantity. Lead time can be an issue, but in order to avoid that, we need to cut out and simplify the bureaucracy process, where the selection of the supplier can be approved by managerial level (normal Purchase Order is signed by Vice President). The consideration is that the value of purchase for this category is not high, therefore managerial level is enough to approve and sign this Purchase Order.

### Consumables Category

Table 7. Consumables Category

Forecast Accuracy	Low	High Usage due to Standardization
Supply Risk	Low	Many Suppliers
Profit Impact	Low	Low Profit Margin
ClocksPEED	Low	No Evolution

Source: data processed

The discussion at FGD has concluded the impact of each criteria and the purchasing strategy for Consumables category. In Consumables category, the demand is not constant from time to time, depending on customer's requirement, so forecast accuracy is low. Supply risk, profit impact, and technology evolution are also low, but similar to Standard Parts category, the unavailability of consumables, can cause bottleneck in the production (repair and/or manufacture) process. Having stock for consumables are risky, due to the shelf life of consumables. Therefore, the appropriate strategy for this category is to have Long Term Contract with the suppliers, and keep the consumables at suppliers' storage, and request to delivery when required.

The applicability of Long Term Contract for consumables might be tricky, due to aforementioned shelf-life. Therefore, Purchasing shall give the clear forecast to the suppliers, so that they can manage their own inventory of the consumables. Similar to Standard Parts, the demand for consumables can be defined based on the historical data of Customer Support requirement from the past 3 years, and the suppliers will manage their own inventory.

### Control Phase

After the implementation of the improvements, the next important thing is to ensure that the system works and the issue is permanently erased. In order to do that, we shall control and monitor the improvement process in time-to-time basis and set the baseline to consider whether the improvement works as planned or not.

The proposed controlling process to measure and assess the improvement is to use Leading and Lagging Indicator. A Leading Indicator is used as a predictive measurement, where Lagging Indicator is used as an output measurement.

Leading Indicator - Leading Indicator will be how we indicate a future event used to drive and measure activities carried out to have positive effect on Customer Satisfaction. The ideal lead time for purchasing is 10 days from Sales Order to Purchase Order. The improvement process shall shortened the purchasing lead time, which leads to on time delivery and on quality delivery to customers. The improvement KPI for Leading Indicator is as follow:

Table 8. Leading Indicator

Sales Order to Purchase Request average lead time	3	Days
Purchase Request to Purchase Order average lead time	7	Days
Average Purchase Order per Purchaser per month	20	PO / purchaser / month
Average Delivery day delay to Customer	0	Average days

Source: data processed

Lagging Indicator - Lagging Indicator is created to measure and to control whether the improvement is working or not. Key Performance Indicator shall be the tools to use, and shall be breakdown and monitor in quarterly basis. The ideal lead time for purchasing is 10 days from Sales Order to Purchase Order. The improvement process shall shortened the purchasing lead time, which leads to on time delivery and on quality delivery to customers. The improvement KPI for Lagging Indicator is as follow:

Table 9. Lagging Indicator

On Time Delivery	100	%
Number of Customer Complaint	0	Average day delay
Customer Satisfaction	4	Out of 5

Source: data processed

## CONCLUSION

In order to avoid more financial losses, especially for ISP & GSE line of business, then it is important to avoid the delay delivery to the customers and to improve the procurement process. Lead Time and Quality are the main important things for customers, and therefore, the purchasing strategy for the procurement shall be based on those 2 factors. Procurement shall have different purchasing strategies for each material classification.

In conclusion, Table 10 below is to show the resume of each purchasing strategy:

Table 10. Resume of Purchasing Strategy

Class A	Strategic Partnership (propose to use Power By the Hour concept)
Avionics, Electric, & Instruments	Many Suppliers (use effective contract as addition)
Structure	Make or Buy (when outsource, keep core competency)
Standard Parts	Safety Stock
Consumables	Long Term Contract (with suppliers to manage their inventory)

Source: data processed

With the above strategies, it is expected that ISP & GSE shall have sustainable and continuous business, gain more customer satisfaction, and avoid any financial losses.

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