

Measurement Cargo Shipment Quality through the Unit Load Device (ULD) PT. Garuda Indonesia SBU Cargo using Six Sigma Method

SRI WIDYANESTI* AND INDRAKA FADHLILLAH

Universitas Telkom, Bandung, Indonesia

ABSTRACT

This study aims to measure for improving the quality of delivery cargo through Unit Load Device (ULD) PT Garuda Indonesia SBU Cargo. Researcher uses a mixture of qualitative and quantitative with six sigma approach. With three of the five stages of six sigmas, namely: define, measure and analyze along with some auxiliary tools, the results show that there are five factors known problem that occurs with sigma level of 4.8 which indicates the delivery process through the ULD in PT Garuda Indonesia is working normally. In addition, with fishbone diagram analysis show that the known CTQ Potential are ULD damage, delay of goods, damage to goods and not real-time Database with each having a weight of 3, and of the Pareto chart is known of CTQ key is ULD damage. The latter five why analysis using weights to each question are known root causes of the key issues, namely the SBU management policies into operating divisions in PT. Garuda Indonesia Cargo SBU by following a weight in each question.

Keywords: Analyze, Define, Measure, Six Sigma, Unit Load Device (ULD).

*Corresponding author: Email : Widiyanesti.sri@gmail.com

INTRODUCTION

Globalization and global trade make air cargo traffic has grown substantially over the last few years. According to the forecast of the World air cargo carried by (Boeing, 2014), air cargo traffic will grow by 2.6% per year, or increased threefold over the next 20 years. In general, air cargo traffic will increase from 166.8 billion RTKs (Revenue Ton Kilometer) in 2013 to more than 526.5 billion RTKs in 2033. Trends, and the symptoms are also theoretical considerations, it is known that the importance of distribution management good as a good quality, not to mention also cargo service company, where the manufacturer must be able to ensure the integrity of the goods, on time delivery of goods, as well as maintenance and the effectiveness and efficiency in running business processes.

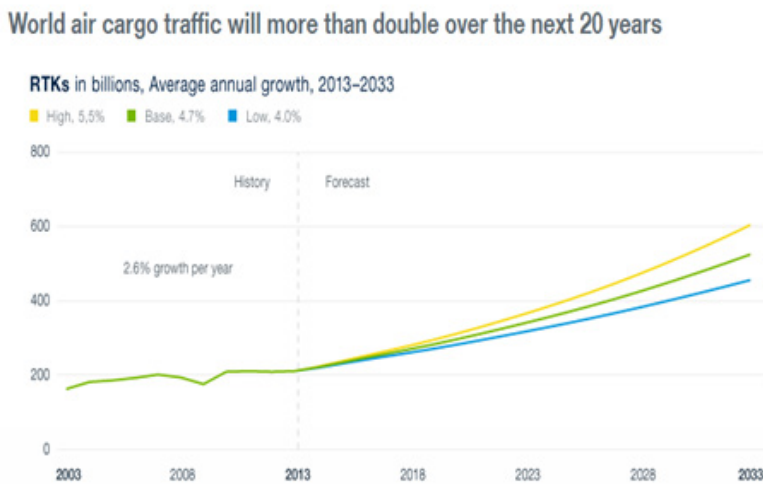


Figure 1 *World Air Cargo Forecast 2014*
Source: Boeing (2014)

According to Farid (2014) one of the important components in achieving this goal is the use of Unit Load Device (ULD). ULD is a tool for loading cargo / baggage that has been designed specifically for transporting the plane into the air. With the ULD can certainly help to ensure the integrity of the goods as well as the effectiveness of time and cost efficiency, not to mention PT. Garuda Indonesia SBU Cargo which also implements the use of ULD with these objectives. Inability to manage usage ULD will certainly disrupt the delivery of luggage of passengers and goods by air cargo flight departure delays. Equipment named “ULD” This is a tool supporting the aircraft can load or transport goods passenger cargo / baggage before it is inserted into the aircraft. In fact, PT. Garuda Indonesia SBU Cargo is the one that gives attention to it to prepare a plan for the operation of the readiness and availability of ULD, Garuda SBU Cargo must also be able to participate and care in optimizing utility ULD, according to Farid from (PT. Garuda Indonesia SBU Cargo, 2014) to maximize / earned income as much as possible at the same time minimizing the cost of the eagle should be able to improve the productivity and quality of service processes in order to improve profitability and destination PT. Garuda Indonesia SBU Cargo. One of the tools that can measure it is using Six Sigma. According

(Brue, 2005), Six Sigma is a method to improve productivity and profitability. Six Sigma methodology is the implementation of a statistical problem-solving tools to identify, quantify waste and shows the steps for improvement. Six Sigma gives detailed questions regarding the processes implemented in a company, and then provide a solution. It is also getting rid of variations that cause waste, changing business culture, and create the infrastructure needed to start and sustain the productivity, profitability, and quality levels with better process. Since the nature of Six Sigma that designed to improve process engineering and reduce cost, it is believed that using the methods can help PT. Garuda Indonesia SBU Cargo to see the quality of delivery of cargo through the ULD can be maintained and improved systematically. Based on this background, this study aims to measure for improving the quality of delivery cargo through Unit Load Device (ULD) PT Garuda Indonesia SBU Cargo. This research uses a quantitative approach and qualitative approach.

This paper is organized as follows : Section 2 reviews the literature; Section 3 lays out the methodology; Section 4 contains a discussion of the empirical findings; and Section 5 provides conclusions.

LITERATURE REVIEW

Operations Management

Operations Management (Operations Management) is a series of activities that produce value in the form of goods and services by transforming inputs into outputs activity that produces goods and services taking place at all organizations. In manufacturing, production activities that produce goods can be seen clearly. In organizations that do not produce physical products, the production function may not be obvious. We often refer to these activities as services (Heizer and Render, 2009: 4). According Heizer and Render (2009: 5), there are four benefits of studying operations management (MO), namely:

1. Operations Management is one of the three major functions of any organization as a whole and is associated with all the other business functions. All organization market (sell), finance (recorded income) and produce (operate), it is very important to know how the activity of walking MO. Hence, we learn how people organize themselves for productive enterprise.
2. We study the Operation Management because we want to know how the goods and services produced. The production function is a part of society that creates products that we use.
3. We study the Operation Management to understand what is done by the operations manager. By understanding what is being done by this manager, we can build the skills required to become a manager like that. This will help to explore employment opportunities are numerous and lucrative in the field of Operations Management
4. We studied Operations Management because this part is the part that most spending costs in an organization. Most corporate spending MO used to function. Nevertheless, MO provides an opportunity to increase profits and service to the community.

Definition of Quality

Garvin on Pressman (2010) from Harvard Business School states that “quality is a complex concept and diverse” which can be described from five different angles. View deeper (like Persig) argues that quality is something that we recognize, but cannot explicitly specify. According to Pressman (2010) view users see the quality of the end user in terms of a particular purpose. If the product meets these goals, it shows the quality. View of the mill define quality in terms of the original specification of the product. If the product according to the specifications, it shows the quality. View of the product shows that the quality can be attributed to the inherent characteristics (functions and features) of a product. Finally, the quality of value-based view of the action based on how much the customer is willing to pay for a product. In fact, the quality of covering all these views. Pressman (2010) the quality of the design refers to the characteristics that determine the design of the product. Classroom materials, tolerances and performance specifications all contribute to the quality of the design. As a higher grade materials are used, tighter tolerances and a greater degree than the specified performance, quality design of a product increases, if the products are manufactured according to the specifications. In software development, quality of design includes the extent to which the design meets functionality and certain features in the model requirements. Quality of conformance focuses on the extent to which implementation follows the design and the resulting system meets the requirements and performance goals. But the quality of design and quality of the suitability of the only problems that software developers must consider. While Pressman Glass (2010) found the quality of the system, application or product is a requirement that explains the problem, design a model solution, which makes the program code can be executed and the test software testing to find errors. Good software engineering uses the measurements to assess the quality of the analysis and models design, source code, and test cases are created when the software is engineered. To achieve the quality of real-time, must use a technical measure to evaluate the quality of an objective manner.

Quality Management

According Heizer (2009), the operations manager, one of the most important jobs is to provide products and services that are healthy, safe, and quality to customers. Due to the lack of design and production processes, the development of low-quality products not only result in higher production costs, but also can cause accidents, lawsuits, and increasing government regulations. Heizer (2009) says to look for the important work that is necessary for a good process on an ongoing basis, not only that even the quality standards need to be done in order to achieve the specified quality. To that end, there are four sizes in the management of quality, namely:

International Quality Standards (ISO)

Global quality is very important that the World came together to create a single quality standard, ISO 9000. ISO 9000 is the only standard of quality that is recognized internationally. The focus of this standard is to define the quality management procedures through the leadership, detailed documentation, work orders, and record keeping. Keep in mind, these procedures are not stating anything about the real quality of their products entirely devoted to the standards that should be followed.

The process of internationalization of proven quality continues with the development of ISO 14000. ISO 14000 is an environmental management standard that contains five main elements: environmental management, auditing, performance evaluation, labeling and life cycle assessment.

Total Quality Management (TQM)

Total Quality Management (TQM) refers to the suppression of quality covering the entire organization, from suppliers to customers. TQM emphasizes the management's commitment to get a referral companies that continue to want to achieve excellence in all aspects of products and services that are important to customers.

Continuous Improvement

Plan-Do-Check-Act Walter Shewhart, the pioneer of quality management, developed a model circle known as the PDCA (Plan, Do, Check, Action), which according to him is a continuous improvement of its own version.

Edward Deming who then brought this concept to the Japanese during the work after World War II. PDCA cycle is shown as a circle to emphasize the continuous nature of the repair process. The Japanese use the word to describe the kaizen continuous improvement process that never stops for the establishment and achievement of higher goals.

Six Sigma

Six Sigma according (Gaspersz, 2002) is a comprehensive and flexible system for achieving, sustaining and maximizing business success. Six Sigma is uniquely driven by a strong understanding of customer needs, disciplined use of the facts, data, and statistical analysis, as well as careful attention to managing, improving and reinvest business processes. Six Sigma is a way of thinking to manage a business or department. Six Sigma emphasizes customer and using facts and data to find solutions better. Six Sigma can also be viewed as the process control industry that focuses on the customer through an emphasis on process capability. Gaspers (2002) said the three main areas that became the target of six sigma efforts are: improve customer satisfaction, reduce the cycle time, and reduce defects (defects). The improvements in these areas usually results in dramatic cost savings, as well as opportunities to retain customers, enter new markets, and build a reputation for product and service with high performance.

Six Sigma (Gaspers, 2002) is a comprehensive and flexible system for achieving, sustaining and maximizing business success. Six Sigma is uniquely driven by a strong understanding of customer needs, disciplined use of the facts, data, and statistical analysis, as well as careful attention to managing, improving and reinvest business processes. Several stages that must be passed within six sigma include:

DEFINE

Define by (Gaspersz, 2002) is the first operational step in a six sigma quality improvement program. This stage is the stage of defining control and quality improvement with Six Sigma to a product / process is the most critical in select based on priority. Some other activities that need to be done to support the definition phase include:

Identify key processes and key customers

In this define phase, should be defined key processes, as well as customers who are involved in any such process. Customers here can be internal and external customers. SIPOC the model used here, which is a useful tool and the most widely used in the management and process improvement. SIPOC name is an acronym for the five main elements of the quality system.

Defining the specific needs of customers

To define the specific needs of the customers previously we need to understand and distinguish between the two categories of critical requirements, namely: the output requirements and service requirements. Output requirements relating to the characteristics or features of the final product (goods or services) are delivered to the customer at the end of a process. While the terms of service is an indication of how customers should be treated or served during the execution of the process itself.

Determination of the key CTQ

CTQ (Critical to Quality) is a key quality characteristic that are directly related to customer satisfaction, both internal and external.

MEASURE

According (Gaspersz, 2002) measure is the second operational step in a six sigma quality improvement. Basically this measurement can be performed at three levels, namely the level of the process (process level), the output level (output level), and the level of outcome (outcome level). Measurements at the level of the process is to measure each step or activity in the process and the quality characteristics of the input submitted by suppliers (suppliers) that control and affect the quality characteristics of the desired output. The purpose of the measurements at this level is to identify behaviors that govern every step in the process and use these measures to control and improve operational processes as well as estimates of output to be generated

before the output produced or handed over to the customer. While measurements on the output level is to measure the quality characteristics of the output produced from a process compared to the specification of quality characteristics desired by customers. At the level of outcome measurement is to measure how well a product (goods or services) that meet the specific needs and expectations of the customer's rational.

Performance Measurement Baseline

Projects Six Sigma focuses on efforts active in quality improvement to failure (zero defect) so as to provide total satisfaction to customers, so the need to know in advance the level of performance of the current (current performance) or in the terminology of six sigma is referred to as the baseline performance (performance baseline). Baseline measurement of performance at the level of the process carried out when the process consists of several sub-processes. Measurement of baseline performance at the output level do directly on the final product to be delivered to the customer. Baseline measurement of performance at the level of outcome made directly to customers who receive the output or product of a process

ANALYZE

Analyze according Gaspers (2002) is the third operational step in a six sigma quality improvement program. In the analysis phase will be determined the stability and capability of the process and will be identified the sources and root causes of defects or failures.

Improve

According Gaspers (2002) on the improve phase designed solutions in performing control and quality improvement with Six Sigma to the processes that need improvement, the draft form of the proposed improvement of the quality for each CTQ potential and design of experiments, which is expected to improve the performance quality of the products produced by the process by increasing the value of DPMO and Sigma level of capability.

Control

Control in (Gaspersz, 2002) is the last operational phase in the control and quality improvement with Six Sigma. At this stage made sheet controls are used to control processes or services during implementation so as to achieve the target of six sigma. Furthermore, control and six sigma quality improvement in service or another process defined as a service or a new process should be improved following the DMAIC cycle. In this way there will be an increase in quality that is integrated within the organization or company.

Brainstorm Tools

Brainstorming according Nexmu (2011) is a technique that systematically generate ideas to deal with challenging situations, which is produced from a group of people to maintain the freedom of thought. There are several opportunities generated from the brainstorming that can improve productivity, increase sales, find new areas of business development, launching new products or define new processes. Some of the techniques in operations management such as affinity, nominal group technique, cause and effect diagram, failure mode effect analysis, 5 whys, fault tree analysis, decision matrix, and risk analysis requires brainstorming as an integral part of the execution of the technique. Brainstorming is needed to generate inputs for the techniques above. Examples of this type of brainstorming is required here can be observed in the 5-why Analysis, where the brainstorming occurs for every why a hierarchical manner until the root cause is found. In Six Sigma, brainstorming usually useful during the Define phase, especially when using tools such as Failure Node and Effects Analysis

Fishbone Diagram

According Besterfield, *et al* (2003: 464), cause-effect diagram is an image consisting of lines and symbols that are designed to show the relationship between the impact and causes. This diagram was developed by Dr. Kaoru Ishikawa in 1943 and is sometimes commonly referred to as Ishikawa Diagram or Fishbone Diagram because of its shape. In addition, the fishbone diagram can be determined according Nexmu weight to determine the root of the most basic problems.

Pareto Chart

Pareto chart (Pareto Chart) is a method for managing errors, problems, or disability in order to help focus attention on efforts to resolve the problem. This diagram is based on the work of Vilfredo Pareto, an economist in the 19th century. Joseph M. Juran popularize Pareto jobs with 80% stating company's problems are the result of causes that 20% only (Heizer and Render, 2009: 319).

Five Why Analysis

According Liker, Jeffrey K. (The Toyota Way, 2006: 303) section that integrates with Kaizen is a five-why analysis (five-why analysis) famous from Toyota. According to Yuichi Okamoto, a former vice president of the Toyota Technical Center "We have a very advanced technique to create new products. It is called the five-why. We ask why five times."

Solving the real problem requires identification of the root cause is not the source, the root cause lies hidden behind the source. For example, when it discovered that the source of the problem is a supplier or a particular machining centers, the problem happens there. But what is the root cause of the problem? The answer is obtained by digging deeper by asking why

the problem exists. Ask 'Why' five times demanded answers of why the first then ask why it happened. Usually the process of asking 'Why' brought into the process upstream. There may be defects that occur in the assembly, but the root cause is tipped on suppliers of raw materials, in which the variation of the thickness or hardness of steel affects the section in print, which then affects the way of welding, and affect the ability of the tool holder on the assembly line components. In addition, the five why analysis can be determined according Nexmu weight to determine the root of the most basic problems.

RESEARCH METHODOLOGY

This type of research is basic research (Basic Research) using a quantitative approach, using a qualitative approach, qualitative research approach is used when conducting interviews to find problems in the process of sending cargo through Unit Load Device (ULD) in PT. Garuda Indonesia SBU Cargo. According to (Bogdan and Goba, 2012: 49), qualitative research is a research procedure that produces descriptive data in the form of words written or spoken of people and behaviors that can be observed.

RESULTS AND DISCUSSION

1. The causes of defects in the quality of delivery Cargo PT. Garuda Indonesia.

Results of the analysis stage of six sigma in the define phase using brainstorming tools there are some defects that occur in the ULD management of physical processes in the warehouse by PT. DPP still his fault. (Damage goods, goods delay, damage ULD). In the physical process of transporting and storing ULD management by PT. Gate were still bad. (Damage goods, damage ULD). Network access ULD information system is still volatile. (Database for controlling the ULD is not realtime). Bureaucratic management is still the old airport management. (Delayed Goods) and queue on the Acceptance that accumulate when the peak season. (Damaged). Results of SIPOC diagram, Fishbone diagrams and Pareto Chart to determine Critical To Quality (CTQ) show that there are four CTQ potential problems namely, databases that are not realtime, property damage, delays in goods, and damage ULD, and ULD damaged.

2. The level of sigma and Defect per Million Opportunities (DPMO) for quality delivery Cargo PT.Garuda Indonesia.

From the analysis of the six sigma measure phase the baseline measurement of performance in DPMO in the process of sending cargo through the ULD in PT Garuda Indonesia SBU Cargo is 416.67. Six sigma indicates 4.8, which shows that in a million probability there will be 416 errors in each of its processes. At this stage, the process of delivery at PT Garuda Indonesia Cargo SBU is in good process and normally distributed because the sigma level which exceeds 3 sigma. However, this process could be improved up to zero defect since there are still gap at the level of 4.8 to 6 sigma.

3. The root causes of defects in the quality of delivery Cargo PT. Garuda Indonesia

Analysis of six sigma in the analyze phase which is the third operational step in a program to improve shows that the stability and capability of the process. The sources and root causes of defects or failure using the tools of five why analysis found that the root causes of the incidence of defects in the delivery process ULD cargo through PT Garuda Indonesia SBU Cargo is policy Strategic Business Unit (SBU) for the efficiency and effectiveness on the part of the operational cost savings.

CONCLUSION

This study aims to measure the quality of delivery cargo through Unit Load Device (ULD) PT Garuda Indonesia SBU Cargo (using the six sigma method). The concept of Six Sigma chosen as the concept approach to measuring the quality of delivery of cargo through Unit Load Device (ULD) PT. Garuda Indonesia SBU Cargo. Where Six Sigma can identify, quantify waste and shows the steps for improvement by using 3 of the 5 stages (DMAIC) were performed in order to achieve the target of control and quality improvement with Six Sigma. 3 of 5 phases (DMAIC) Six Sigma Are Define, Measure, analyze where the Define phase using brainstorming tools, SIPOC diagram, fishbone diagrams, and Pareto Chart. In the Measure phase by calculating DPMO sigma level to be able to know the process of cargo delivery services using the Unit Load Device (ULD) in PT. Garuda Indonesia SBU Cargo. Analyze phase using a five-why analysis tools to identify the root cause of the problem that occurred. With these stages can help PT. Garuda Indonesia Cargo SBU to see the level of productivity of cargo movement through Unit Load Device (ULD) PT. Garuda Indonesia SBU Cargo and can maintain and evaluate its use. There are three conclusions taken from this research are:

1. Factors that cause defects or defects in the process of sending cargo through Unit Load Device (ULD) in PT. Garuda Indonesia Cargo SBU found that the ULD management of physical processes in the warehouse by PT. DPP still has fault. (Damage goods, goods delay, damage ULD). At the physical process of transporting and storing ULD management by PT. Garuda were still bad. (Damage goods, damage ULD). Network access ULD information system is still volatile. (Database for controlling the ULD is not real time). Management police in airport management too long. (Delayed Goods) and the line on the Acceptance that accumulate when the peak season. (Damaged)
2. Of the six sigma analysis that the baseline measurement of performance in the know DPMO in the process of sending cargo through the ULD in PT Garuda Indonesia SBU Cargo is 416.67 Sigma. That sigma indicates its size is 4.8, the average forecast of 416 defects per million opportunities that shows that in one million possible there will be 416 errors in each of its processes, at this stage of the process of delivery of cargo PT Garuda Indonesia Cargo SBU is in good process and normally distributed because the sigma level which exceeds 3 sigmas.

3. Analysis of six sigma in the analyze phase which is the third operational step in a program to improve shows that the stability and capability of the process. The sources and root causes of defects or failure using the tools of five why analysis found that the root causes of the incidence of defects in the delivery process ULD cargo through PT Garuda Indonesia SBU Cargo is policy Strategic Business Unit (SBU).

REFERENCES

- Boeing. (2014). World Air Cargo Forecast 2014. Retrieved from <http://www.boeing.com/commercial/market/cargo-forecast/world-air-cargo-traffic-growth-detail/>.
- Brue, G. (2005). *Six Sigma for Managers*. Jakarta : Media Global Edukasi.
- Cargo, Garuda Indonesia. (2013). "New". Retrieved from: <https://cargo.garuda-indonesia.com/index.php/news/latest-news/>
- Cargo, Garuda Indonesia. (2013). "About us". Retrieved from: <https://cargo.garuda-indonesia.com/index.php/about-us/>
- Cargo, Garuda Indonesia. (2013). "Cargo Knowledge". Retrieved from: <https://cargo.garuda-indonesia.com/index.php/cargoknowledge/cargo-knowledge/garuda-fleet/>
- Cargo, Garuda Indonesia. (2013). "Products". Retrieved from: <https://cargo.garuda-indonesia.com/index.php/products/>
- Cheng, T. & Choy, P. (2007). Measuring Success Factors of Quality Management in the Shipping Industry. *Maritime Economics & Logistics*, 9(3), 234-253. <http://dx.doi.org/10.1057/palgrave.mel.9100179>
- Indonesia, Garuda. (2014). "Unit Bisnis Strategis dan Anak Perusahaan". Retrieved from: <https://www.garuda-indonesia.com/id/id/corporate-partners/business-subidiaries/index.page?>
- Indonesia, Garuda. (2014). "Profil Perusahaan". Retrieved from: <https://www.garuda-indonesia.com/id/id/corporate-partners/company-profile/index.page?>
- Indonesia, Garuda. (2014). "Tentang Garuda Indonesia". Retrieved from: https://www.garudaindonesia.com/id/id/corporate_partners/corporate_index.page?
- Gamal Aboelmaged, M. (2010). Six Sigma quality: a structured review and implications for future research. *International Journal Of Quality & Reliability Management*, 27(3), 268-317. <http://dx.doi.org/10.1108/02656711011023294>
- Gaspersz, V. (2002). *Lean Six Sigma for Manufacturing and Service Industries*. Jakarta: PT Gramedia Pustaka Utama.
- Ishikawa, K. (1982). *Guide to Quality Control*. Hongkong: Asian Productivity Organization.
- Liker, Jeffrey K. (2006). *The Toyota Way*. Jakarta: Erlangga.
- Nexmu. (2011). *Lean Six Sigma Green Belt*. Bandung: Institut Manajemen Telkom.
- Pressman, S.R. (2010). *Software Engineering 7th Edition*. New York: Mc Graw-Hill.
- Render, B., and Heizer, J. (2009). *Manajemen Operasi (Edisi 9)*. Jakarta: Salemba Empat.
- Simamora, Bachtiar H. (2013). Leadership for Performance Excellence. *International Business Management*, 7: 247-257.