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SERVICE QUALITY ANALYSIS AND IMPROVEMENT OF PURCHASING DEPARTMENT IN OIL AND GAS COMPANY (CASE STUDY: PT.A)

Hendra Wahyudi
Student ID. 9115 2017 14

Supervisor:
Dr. Ir. Bambang Syairudin, MT
Dr. Ir. Fuad Achmadi, MSME

MAGISTER PROGRAM
MAJOR OF INDUSTRIAL MANAGEMENT
DEPARTMENT OF MANAGEMENT TECHNOLOGY
FACULTY OF BUSINESS AND MANAGEMENT TECHNOLOGY
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
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LEMBAR PENGESAHAN

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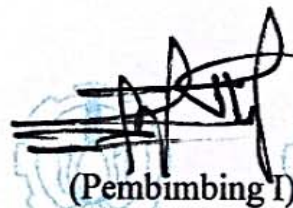
HENDRA WAHYUDI
NRP. 9113202824

Tanggal Ujian : 5 April 2017
Periode Wisuda : September 2017

Disetujui oleh :

1. Dr. Ir. Bambang Syairudin, MT

NIP : 196310081990021001



(Pembimbing I)

2. Dr. Ir. Fuad Achmadi, MSME

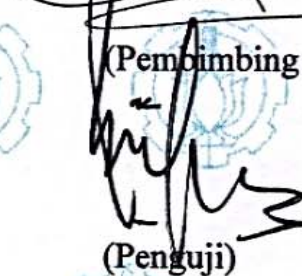
NIP : 910000014



(Pembimbing II)

3. Dr. Ir. Bustanul Arifin Noer, MSc

NIP : 195904301989031001



(Penguji)

4. Dr. Ir. Mokh. Suef, MSc(Eng)

NIP : 196506301990031002



(Penguji)

Dekan Fakultas Bisnis dan Manajemen Teknologi,


Prof. Dr. Ir. Udisubakti Ciptomulyono, M.Eng.Sc.

NIP. 195903181987011001

PREFACE

Praise and thanks to God Almighty for His plenty of grace and His guidance, so we can carry out this research and finish this thesis as expected and as good as possible.

This thesis is submitted to fulfill one of the requirements for master degree of Master Management of Technology with concentration in Management Industry in Institute Technology of Sepuluh Nopember (ITS) Surabaya. In this occasion, the writer would like to convey the gratitude for every people who have given their kind help in performing the research, they are:

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11. Mr. Hadi Wahyudi, my father, Mrs. Laniwati, my mother, who always give the writer her best supports,
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Finally, the writer realizes there are unintended errors in writing this thesis. The researcher really appreciates all readers to give their suggestion to improve its content in order to be made as one of the good examples for the next thesis.

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Hendra Wahyudi

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ABSTRACTS

PT. A is the Oil and Gas Company operated in Indonesia, works with the supplier to do the operations thru contracts agreement. The user, who uses the contract thru Contract and Procurement Division, drive the needs of the service or material. C&P Division objective is to satisfy the users thru the statement: "To provide Goods and Services at optimal cost, in order to achieve effective, efficient operations and customer satisfaction". Refer to the Customer Satisfaction Survey; Purchasing Department's service quality is 68%, therefore this study intends to analyze and to improve Service Quality of Purchasing Department.

In this research, there are 3 top biggest gaps effecting the users' satisfaction that identified: The procurement process already included in the business framework; Knowledge on Know-How on the operation in OG applied in the procurement process; Fastest procurement lead-time. To improve the gap that identified, there are 11 technical response as priority that potentially bring up service quality satisfaction, such as: Conduct regular DUET meeting, Review of purchasing objective, Clear specification of PR, Conduct C&P staff competency assessment, Socialization of related regulation, Sharing Knowledge (Contact), Enhance Procurement Compliances, Survey/Visit Field/Workshop/Supplier premises, Issue procurement planning, Regular training for Purchase Engineer, Utilize and enhance REX+, Ensiklo. After having the technical response priorities, using Altshuller's principles, to improve the technical response, considering the aspect of improving and worsening from those Altshuller's principles.

These actions plan for improvements are recommended to be implemented and to be closely monitor and recommence to its objective, in order to improve the Service Quality of Purchasing Department.

Keywords: Oil and Gas, Contract and Procurement, River Model, SERVQUAL, QFD, TRIZ.

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CHAPTER 1

INTRODUCTION

1.1. Background

Oil and gas activities are classified in two categories: upstream and downstream activities. Upstream activities can be defined as exploring, acquiring, drilling, developing and producing oil and gas reserves. They include all activities that lead oil and gas reserves to be processed from reserves in the ground to resources ready to be sold or used. Downstream activities refer to refining, processing, marketing and distribution.

PT. A is subsidiary company of Group Paris with operation site in East Kalimantan. PT. A supply more less 8% of oil needs in Indonesia in 2014, also supplying 32% of gas for Indonesia needs in 2014 (*Perrine Toledano, Indonesia Associated Gas Utilization Study, 2015*).

PT. A is the world's 5th ranked Oil and Gas Company (*Company Internal Net, 2016*). These companies explore oil and gas in 130 countries with production field in 30 areas such as North Sea, Africa, Middle East, Southeast Asia, North America, South America. PT. A has a contract with SKK Migas (Satuan Kerja Khusus Minyak dan Gas Bumi), the contract was build in Jakarta, August 1968 with the operation in Mahakam Area, East Kalimantan, Indonesia.

At the beginning, fields that owned by PT. A is Bekapai and Handil, then Tambora field was found in 1974 and Tunu in 1977. PT. A Indonesia not only produced crude oil but also produces gas that will be supply to Bontang directly via Senipah site.

The division that supports company's operations in PT A is Contract and Procurement division (C&P). The main goal is to support company's operations in a safe, effective and cost efficient way in compliance with prevailing regulations & policy while providing goods and services in professional and ethical manners. The entire process of supply chain is not only

Ordering services and goods and receiving them into inventory, but also making sure that they are delivered to the users at the right time.

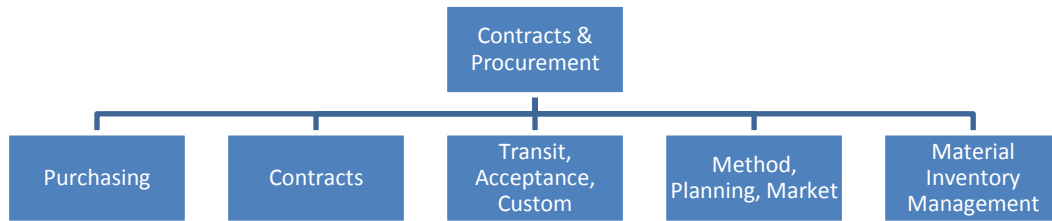


Figure 1.1 Organization Contracts & Procurement Division

All the Contract and Procurement activities are based on Company Regulation (CR) with its three main phases (Planning Phase, Procurement Phase and Commitment Follow-up). And in accordance to the Rule 1 of that CR, to respect the local rules and regulations, specific phase and methodology in the activities shall fully comply with the applicable guideline from the government, i.e. SKKMIGAS PTK 007 (Guideline to Contract and Procurement for Production Sharing Contract). C&P is only one actor in doing the Contract-Procurement process within the company. It can contribute as a co-responsible with other actors, namely: requesters, users, line management, government, and suppliers. But it cannot solve these problems alone. The exercise to be conducted actually is the interdependent search for a joint approach, to which everyone should contribute.

The supply chain process in PT A is defined in the main C&P rule as below figure.

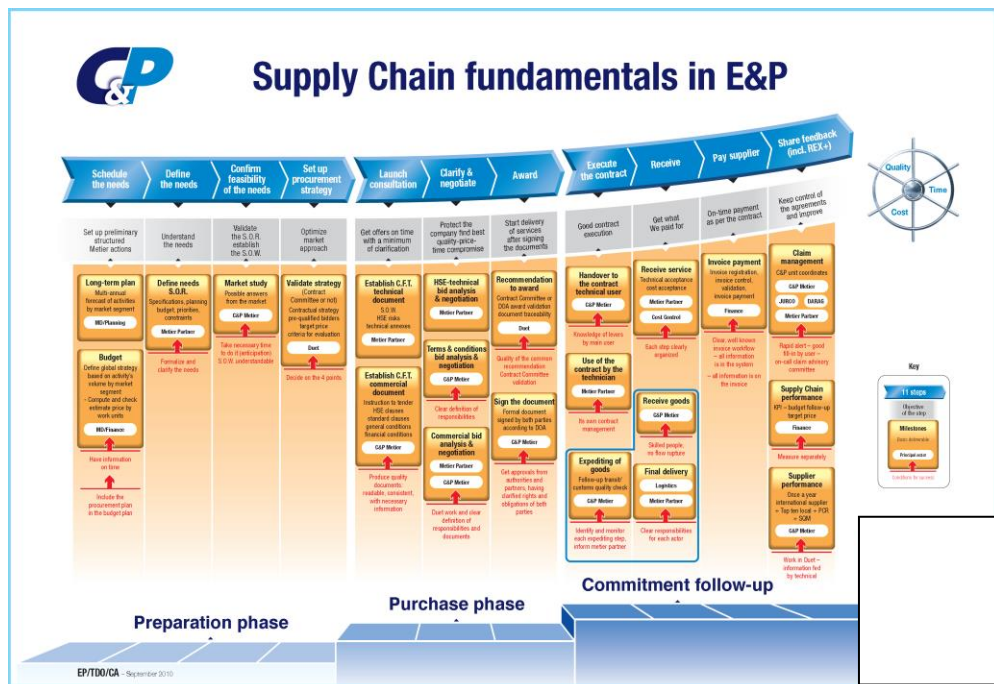


Figure 1.2 Supply Chain Fundamental in PT. A

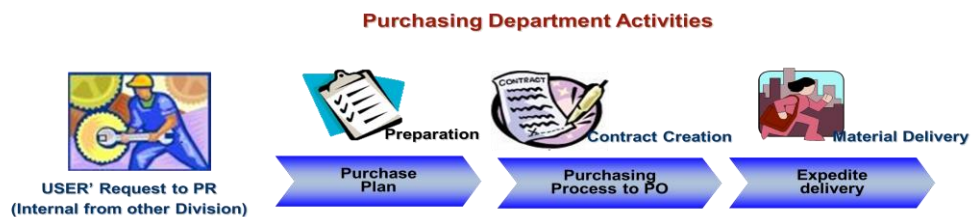


Figure 1.3 Purchasing Activities in PT. A

Contract & Procurement Division involves the activity of planning, implementing, and controlling operations, which covers procurement of goods (C&P/PRC), contracting supply of services (C&P/CTC), development of methods and Contract & Procurement improvements (C&P/MPM), management of stock inventory (C&P/MIM), freight forwarding, importation operations (C&P/TCA).

As shown in figure above, main works the Purchasing Department in Contract and Procurement Division to support the users are:

- To make planning based on the needs of the operations

- To review the Statement of Requirement (SOR) and Scope of Work (SOW) to indicate into Instruction to Bidder (ITB) for the bidders in the tender preparation
- To monitor and follow up orders
- To negotiate on behalf of user on the purchasing
- To procure the material within the required time line, in the corridor of the regulation from the Government and Head Quarters
- To request for an approval to the authorities
- To expedited the delivery of material
- To review the performance of the vendors that supplied the material

Procurement Department (C&P/PRC) in PT A is responsible for obtaining materials needed for operational division that includes the process of preparation, processing of demand, as well as the end of receipt and approval of payment. The division is divided into 4 subdivisions according to material category or users' entity for the procurement namely Logistic Sea Air, Well Construction Intervention, General Support Division (PR1) which hold around 65% of the budget for purchase; Field Operation and Engineering, Construction and Project (PR2) which hold around 35% of the budget for purchase. Several actors are involved in the whole process, thus it is not solely based on the task of procurement only. In the process activity of Contract and Procurement division is heavily dependent to other actors, and one of the factor that can determine the successful of Contract and Procurement division is on how the service quality of the division measured by it users.

Department	Satisfied	Dissatisfied	
PRC	68%	32%	☹️

Customer Satisfaction Survey, Annual SC DAY, 2014

Notes:

- Need to identify the root-cause of not-satisfy users
- Need to do actions to improve users' satisfaction

Remarks:

- ≥70% 😊
- 50 % ≤ x ≤ 70 % 😐
- < 50% ☹️

Figure 1.4 Satisfaction Survey of Purchasing Department

Seeing from the Performance Monitoring data as figure above, and from the general feedback of users to management of C&P division during the Annual Performance review in, found that the Service Quality of the Contract & procurement division needs to be improved, especially for the Purchasing Lead Time, Delivery time of the vendor, quality of the material, best price can be obtained (especially in the environment of the low oil and gas price), simplicity but still comply with the regulation of the Company and Government.

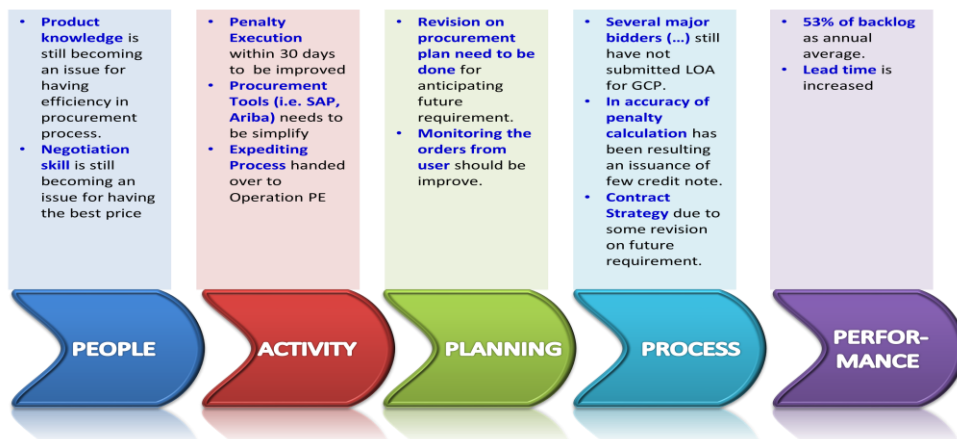


Figure 1.5 Global objective of Purchasing Department in PT. A

Delay or any problem on the procurement or delivery of the material can cause huge problem in the industry of oil and gas, since it can cause failure in the operation and loss not only money but also the oil spill, blow out, etc. The delay

that often occurs that would cause harm to the company and its supplier in the frame of time and costs, as well as the completion of quality deviations. In addition, it will also cause the decrease of credibility in front of the stakeholders. Delay is one of the biggest problems faced by the industry engaged in oil and gas due to material required in the oil and gas business is categorized as Long Lead Items (LLI), which is caused by long manufacturing time, sometimes more than one year to make the material.

The problem of quality of material also found when the material delivered is not same as the Scope of Work; this will cause another delay to return the material, and may cause failure in the operation due to unavailability of the material.

Issues of competence and knowledge of the personnel in this case is Purchase Engineer (Buyer) which is owned by a team of Purchasing Department is also common, with frequent inaccuracy in identifying risk and mitigation in the contract and as well as having knowledge in the Statement of Requirement (SOR) may cause wrong purchasing of material.

Problems of high price of the material bought will cause the budget depleted before the fiscal year, and by this the purchased material will be less rather than required by the operation.

Therefore this study intends to determine the service quality of Purchasing Department and also to determine priorities corrective measures to the problems encountered. The variables in this study are the five dimensions of SERVQUAL attributes on users' expectations and perceptions of service quality Contract & Procurement Division. Data is taken thru questionnaire to users who use the service. The variables in this study are using five dimensions of SERVQUAL with attributes on current and target of service quality received from Purchasing Department. Data are taken from the sample using questionnaire distributed to the user that uses the service. And then doing analysis, first step by River Model to identify the category of service quality from the Purchasing Department having biggest gap of target and actual. From the biggest gap of category in river model then using SERVQUAL analysis to Quality Function Deployment (QFD) method to determine the attribute that affecting the quality of services and final step using

TRIZ (Theory of Inventive Problem Solving) to propose the solution as per required needs.

The results of this study are expected to be useful for improving the quality of service Procurement Department to the users, which can be identify in which services need to be improved and maintained so that users' expectations reached that will eventually be able to support the works in the completion of work on time, right cost and quality.

1.2. Problem Identification

Based on the description above background, the issues that will be discussed is a gap between the reality from the users of service from Contract & Procurement Division with the target needed, also the proposal of corrective action that should be done to improve the quality of services at the Contract & Procurement Division.

1.3. Research Objectives

The purpose of this study is as follows:

1. To identify the gap of service quality between target and actual services received in terms of five dimensions of quality: Tangible, Reliability, Responsiveness, Competence, and Courtesy.
2. To give priority based on category for the corrective measures to the problems encountered.
3. To propose solution for the improvement to be included into Company's Business Improvement Objectives (CBIO) of PT.A.

1.4. Research Benefit

The benefits obtained from this research are:

1. For the organization's benefit, input to the management of Contract & Procurement Division regarding service quality given to its user and to give recommendation to improves its quality services
2. For academic's benefit, this research will be useful to enrich knowledge on Service Quality in the Contract and Procurement sector pertinently in oil and gas industry considering there is a difference between the Contract and Procurement in manufacturing and the Contract and Procurement in Oil and Gas.

1.5. Research Scope

The limitation of this research will be as follow:

1. The research is conducted limited only to internal user of Purchasing Department within the Company of PT.A, in the working area of East Kalimantan, Indonesia.
2. Data and information is derived from the historical period 2014-2016.
3. Analysis of Knowledge Management Framework is using River Model, limited to KM Strategy, Leadership Behavior, Networking, Learning before, during and after, and Capturing Knowledge.
4. Analysis of SERVQUAL limited to Gap 5 is the gap between the expectations of consumers with the services received by consumers.
5. Analysis of Quality Function Deployment (QFD) is limited to Level 1 without derivatives.
6. Analysis of TRIZ using Altshuller's 40 Principles
7. Costs are not explicitly taken into account in this study

1.6. Thesis Organization

Chapter outline used in this research consists of several chapters divided as follows:

CHAPTER I INTRODUCTION

This chapter described the basic things underlying this research such as; determining the root cause to be investigated, the purpose of the research and the benefits in terms of academic and organizational view.

CHAPTER II LITERATURE REVIEW

This chapter contains the theories used in the research. The theory is derived from a variety of sources such as scientific journals and books.

CHAPTER III RESEARCH METHODOLOGY

This chapter elaborated the stages in conducting the research so that the process will be done in a good and systematic approach. The process starts from preliminary studies, literary studies, data collection, data processing, and elaboration of conclusions and recommendation.

CHAPTER IV ANALYSIS AND DISCUSSION

This chapter describes the process of data collection which will be used for the calculations in this research, analysis and evaluation of the results of the information obtained from data processing based on existing theory. Analysis carried out with the methods and tools used in this research. Also give the analysis about result from the previous chapter.

CHAPTER V CONCLUSIONS AND RECOMMENDATIONS

This chapter contains the results obtained from the research by answering the purpose of the research in which the conclusions will be a recommendation or advice to be given to the management of PT.A.

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CHAPTER 2

LITERATURE REVIEW

2.1 Oil and Gas Operations

As specified, one of the scopes of the study is to analyze the Service Quality of the Purchasing Department in Drilling and Well Services needs for the material; therefore the preliminary literature review is on the drilling operations.

2.1.1 Drilling Operation

When an E&P company has identified an area with potential presence of oil and gas reserves, it will seek to acquire the right to explore, develop and produce the resources that might exist beneath the property, this is basically the right to share proceeds from the sale of any minerals produced.

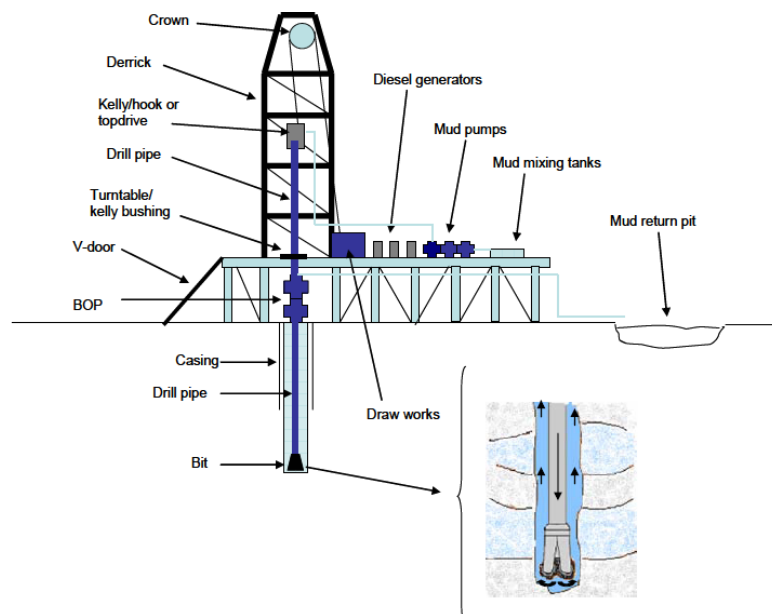


Figure 2.1 Rotary drilling and mud system

Rotary drilling consists of rotating a drill bit downwards through the formations towards target depth, while drilling fluid (“mud”) is circulated down to lubricate the drilling bit and keep formation fluids from entering the wellbore.

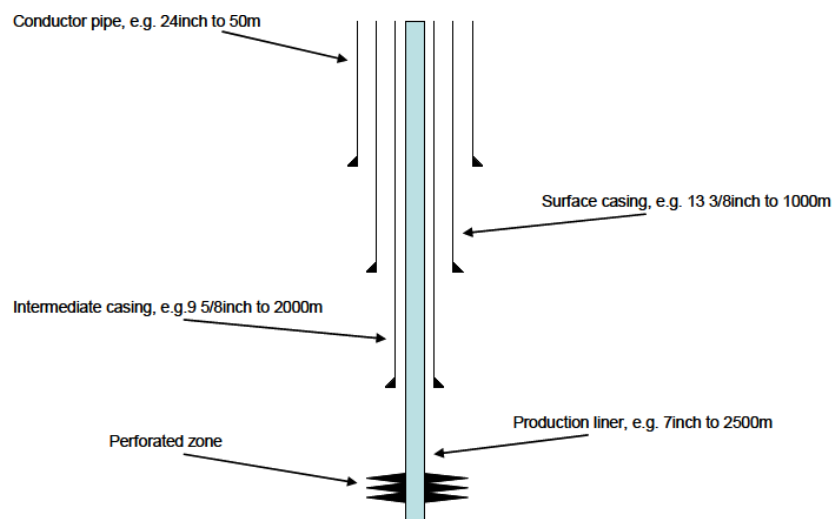


Figure 2.2 Well with four casing strings

Wells are nearly always drilled in stages. When the bottom of each stage is reached the newly drilled hole (“open-hole”) is cased off using steel pipe and becomes a “cased-hole”. This is done to prevent the hole from collapsing on top of the drill pipe. To “set” the casing, it is first lowered into the well. Then the drill-pipe is lowered (without a drill bit on the end) down inside the casing to the bottom, and is used to pump cement up the annulus between the outside of the casing and the hole. This cement sets and bonds the casing to the rock formation that has been drilled through. In this way then, the casing and cement together isolate different reservoirs from each other and from the surface.

Drilling offshore, which is much more expensive, uses mobile rigs (drilling barges and ships, Jack-up drilling platforms, submersible and semisubmersible drilling platforms). The drilling operations are similar to those of onshore rigs but are adapted to the hostile marine environment. Most onshore wellbores are drilled vertically, but some wells are drilled at an angle. These wells can be directional, i.e. they are drilled straight to a predetermined depth and then curved or angled. Horizontal wells are also drilled straight down at first and then curved, gradually, until parallel to the earth’s surface. Horizontal wells allow to access oil and gas reservoirs that would otherwise not be accessible; therefore they have become a preferred method of recovering hydrocarbons. When the desired depth is reached, the well is “logged”. Wireline logging is a set of operations which use cables and downhole instruments to acquire data that will

define whether any oil or gas has been found. A device is lowered to the bottom of the well and then pulled back up to the surface. As the device passes up the well, it measure and records properties of the fluids in it. Based on those measurements, the well may be judged unable to provide oil and gas in commercial quantities. Then, it will be plugged and abandoned. Otherwise, it is completed and production may start. A well is deemed ready for commercial production if the expected net proceeds from production exceed the cost of completing the well.

2.1.2 Production operations

To complete a well and place it on production, the E&P companies should obtain and install production casing, install tubing, which consists in a steel pipe suspended in the well through which the oil and gas are produced, set off charges to create holes in the casing and cement to allow fluids to flow from the formation to the wellbore. Then, they will have to install a blow-out preventer (or Christmas tree) which is consists of valves and fittings that control production at the wellhead. Finally, the company will have to construct production facilities such as separators, tanks, heater-treaters and install flow lines.

2.1.3 From Production to Sale

When oil and gas are recovered from a reservoir, they contain a combination of crude oil and natural gas, basic sediment and water. Therefore, they must be separated, treated and measured before they can be sold. Most of the time, special pipelines take well fluid from the wells to a central gathering center where separators, heater-treaters and other equipment will separate the liquids and gases and remove much of the sediments, water and impurities. Then, crude oil will go to stock tanks (tank farms) to be stored until it is delivered to buyers. After purchase, the oil is measured as it is transported from the storage tanks to truck, ship transport or oil pipeline. On the other hand, gas will not be stored on site but measured when it is gathered, processed and transported to a gas pipeline.

2.2 Contract and Procurement

2.2.1 Supply Chain Management

Supply Chain Management defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole (*Supply Chain Management at a Global Level – A Challenge and an Opportunity for Leading Oil Field Service Company*). Based on this definition can observed that the emphasis is not on simply minimizing cost or reducing inventories but rather on taking a systems approach to supply chain management as explained by *Simchi-Levi, et.al., (2003)*. Normally, several independent firms are involved in manufacturing a product and placing it in the hands of the end user in a supply chain—raw material and component producers, product assemblers, wholesalers, retailer merchants and transportation companies are all members of a supply chain.

Supply Chain Management defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.

There are 3 degrees of Supply Chain Complexity:

- Direct Supply Chain
It consists of company, supplier and customer that involved in upstream or downstream flow of product, service, finance and information.
- Extended Supply Chain

It includes suppliers of the immediate supplier and customers of the immediate customer, all involved in the upstream and/or downstream flows of products, services, finances, and/or information.

- **Ultimate Supply Chain**

It includes all the organizations involved in all the upstream and downstream flows of products, services, finances, and information from the ultimate supplier to the ultimate customer.

A MODEL OF SUPPLY CHAIN MANAGEMENT

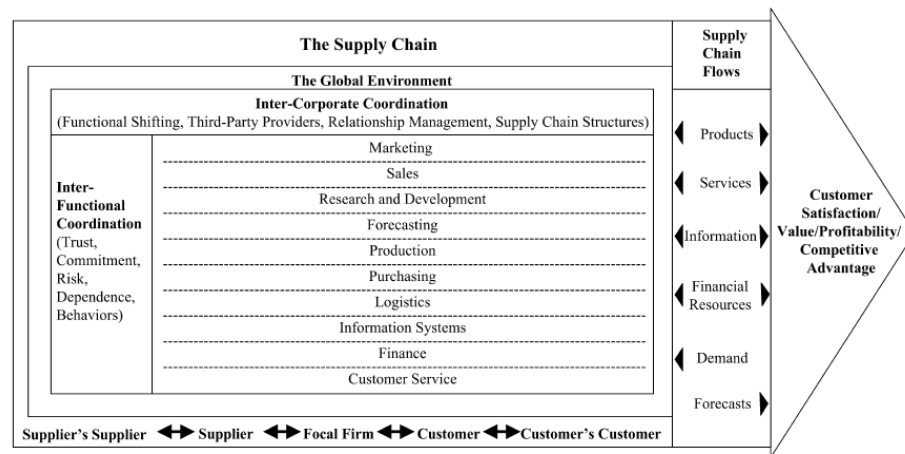


Figure 2.3 Model of Supply Chain Management (Mentzer, *et.al.*, 2001)

The connection or network between organizations is extensive, thus it is important to distinguish the resources flows of a supply chain, namely:

- 1) **Material Flow**

Material flow can be described as the way of a material from its production as raw material through the various stages of finishing up to the stage of end product, the use of the product, and its recovery to its disposal. All manufacturing supply chains have material flows from the raw materials at the beginning of the supply chain to the finished products at the end of the supply chain.

- 2) **Information Flow**

Throughout a supply chain there are abundance of information flows such as demand information, forecasting information, production and scheduling information, and design information flows. In contrast to the material flow, the information can flow both directions both upstream and downstream. Any supply chain will have its own set of information flows that are important to its existence.

3) Financial Flow

Financial flow is the flow of money in a supply chain, it is perceived as the blood stream of supply chain. Supply chain will collapse without this flow. The source of finance flow is the consumer. This understanding of single source of finance has led to a concept of “single entity” perspective of a supply chain, which is a very useful foundation for supply chain integration and collaboration. The distribution and sharing of this single financial resource fairly across a supply chain will allow for the better alignment between the contribution and reward for the participating companies.

Hence, it can be concluded that supply chain is the network that consists of two or more separated organizations, being linked by material, information and financial flow.

2.2.2 Purchasing

Purchasing is the business management function that ensures identification, sourcing, access and management of the external resources that an organization needs or may need to fulfill its strategic objectives. Procurement exists to explore supply market opportunities and to implement resourcing strategies that deliver the best possible supply outcome to the organization, its stakeholders and customers. Procurement applies the science and art of external resource and supply management through a body of knowledge interpreted by competent practitioners and professionals (*CIPS Australia Pty Ltd, 2005*).

Purchasing includes activities and events before and after the signing of a contract as well as the general management activities associated with a range of contracts (*CIPS Australia Pty Ltd, 2005*):

- Pre-contract activities such as planning, needs identification and analysis, and sourcing
- Post-contract activities such as contract management, supply chain management and disposal, and
- General activities such as corporate governance, supplier relationship management, risk management and regulatory compliance (*CIPS Australia Pty Ltd, 2005*).

CIP has identified seven core benefits of procurement (*CIP Australia Pty Ltd, 2005*):

- Security of supply
- Lower costs
- Reduced risk
- Improved quality
- Greater added value
- Increased efficiency
- Innovation

Thus it can be concluded that Purchasing has the linkage with:

1. Work activities (e.g. requirements determination, source selection)
2. Actors (e.g. market researchers, buyers)
3. Organizations (e.g. purchasing and contract management)
4. Technologies (e.g. electronic catalogues, communication networks)

Cross-function, inter-organizational, and system are required to conduct the Purchasing process. As result, the view on that perspective allows one to approach the important aspects of organizations activities.

Van Weele (2005) suggested a division of tasks on following functions.

Table 2.1 Buyer profiles and division of responsibilities (Van Weele, 2005)

Function	Responsibility
Corporate procurement Officer (CPO)	Developing corporate purchasing strategies, systems, reporting.
Corporate buyer	Strategic commodities – large volumes, high investment projects and services. Responsible for developing sourcing strategy for key commodities. Long planning horizon.
Purchasing engineer	New materials and components. New suppliers. Discussing specs, market research, selection of suppliers, negotiations. Work on decentralized level. Liaisons between purchasing and R&D.
Project buyer	Similar to purchasing engineer but focus on equipment and services.
Material planner	Materials planning and ordering, order handling – ensuring material supply, calling off materials against annual agreements. Vendor rating monitor and control supplier's quality and delivery performance.
MRO buyer	MRO supplies – management of the entire assortment of MRO items with regard to overall performance rather than just price focused.

Depending on organizations, the objectives of procurement are generally following six objectives:

1. Support organizational goals and objectives

The most critical objective for purchasing is to support organizational aims. As this may seem obvious, the purchasing goals may not always be in line with the organizational goals. For example, a firm might prefer exclusive partnership with a single supplier rather than selecting competitive quotations.

2. Develop integrated purchasing strategies that support organizational strategies

Traditionally, purchasing has been long perceived as lower level function support and senior management has been slow to recognize the benefits of effective purchasing, which oftentimes purchasing function fails to design strategies that are aligned with the strategies of other function.

However, this brings access to a pool of expertise and a source of market intelligence such as

- a) Monitor supply markets
- b) Monitor emerging trends in market
- c) Identify critical materials needed to support company strategies
- d) Develop alternatives for ensuring supplies of key materials, and contingency plans if there are problems with primary supplies
- e) Supporting the organization's need for a diverse and globally competitive supply base

3. Support operational requirements

In order to satisfy the needs of internal customers, purchasing has to be managed efficiently. Thus, purchasing must assure a supply of materials by:

- a) Buying materials from the right sources
- b) At the right price
- c) With specification that meets user needs
- d) In the right quantity
- e) Delivered at the right time
- f) To the right user

4. Using purchasing resources efficiently and effectively

Since resources such as people, facilities, money, time, information, and knowledge are scarce, it is important to efficiently use them by:

- a) Determining appropriate staffing levels
- b) Developing and keeping within budgets
- c) Providing professional training and opportunities for employees
- d) Ensuring high utilization of capacity at facilities
- e) Designing operations that give high productivity
- f) Monitoring performance and continually looking for improvements
- g) Doing anything else needed to efficient and effective

5. Supply Base Management

Selecting, developing and maintaining a suitable set of suppliers is a key activity in purchasing. Purchasing must keep abreast of current conditions in supply markets in order to:

- Ensure current suppliers are competitive
- Improve and develop existing suppliers, particularly those who are failing behind competitors
- Identify new suppliers who can provide good service and join the supply chain
- Develop new potential of new suppliers whose performance is not yet good enough to join the supply base

In short, procurement process is the set activities and procedures related to acquire materials for an organization. (*Van Weele, 2005*) presents a basic model of the procurement process. This process has six steps:

- 1) Define specifications
- 2) Select supplier
- 3) Contract agreement
- 4) Ordering

5) Expediting

6) Evaluation

This process gives a rather good overall picture of the operative handling of procurement, but it lacks descriptions of other parts of procurement such as measuring performance and advanced supplier management.

2.3 Research Theory

2.3.1 Knowledge Management, River Model

In terms of knowledge management, rely on the knowledge management models introduced by *Romhardt (1998)*. Synthesizing these models to a knowledge management cycle model, this model with its different knowledge cycle activities (identify, acquire, structure, combine, share, distribute, use, preserve, eliminate).

Robbins (2003) defines knowledge management (KM) as a “process of organizing and distributing an organization’s collective wisdom so the right information gets to the right people at the right time. *Laudon (2003)* goes a step further by introducing “knowledge-level decision making based on the evaluation of new ideas for products, services, ways to communicate new knowledge, and ways to distribute information throughout the organization.” This suggests that firms can only sustain a competitive advantage when valuing its customers input and employee interaction. This interaction sometimes requires an employee to use innovation in order to “devise problems, define them, and develop new knowledge from them” (*Van Beveren, 2002*). A number of studies *Defining knowledge management by Choi, 2000, Barclay and Murray, 2000, American Productivity Quality Center(1999), Liss(1999), Murray (1998), Corral (1998), Mayo (1998), Martinez (1998), Chait (1998), Beckman (1997), Stewart (1997), Pascarella (1997), Bassie (1997), O’Dell (1996), Manasco, (1996), Garvin (1993).*

A number of studies have addressed knowledge management processes; they divide knowledge management into several processes (*Alavi & Leidner, 2001; Bhat, 2002; DeLong,1997; Gold et al., 2001; Lee &Choi, 2003; Lee &Yang, 2000;*

Nonaka & Takeuchi, 1995; Ruggles, 1998; Shin et al., 2001; Skyrme & Amidon, 1998; Spender, 1996; Teece, 1998). They have identified many key aspects to this knowledge management process: capture, transfer, and use (*DeLong, 1997*); acquire, collaborate, integrate, and experiment (*Leonard-Barton, 1995*); create, transfer, assemble, integrate, and exploit (*Teece, 1998*); create, transfer, and use (*Skyrme & Amidon, 1998; Spender, 1996*).

For example, *Alavi and Leidner (2001)* considered four processes including creation, storage, transfer, and application. *Gold, et.al., (2001)* clustered various capabilities into four broad dimensions of process capability—acquiring knowledge, converting it into a useful form, applying or using it, and protecting it. *Lee and Choi (2003)* focused on the knowledge creation process, and they adopt the SECI (socialization, externalization, combination, internalization) process model by *Nonaka and Takeuchi (1995)* to explore knowledge creation. *Ruggles (1998)* divided company's knowledge management processes by four categories including generating and accessing, facilitating and representing, embedding and usage, and transferring and measuring.

Many KM models with different approaches and mindsets have been proposed in literature *McAdam and McCreedy (1999)* have identified three broad categories of KM models, namely knowledge category models, intellectual capital models, and socially constructed models. These models are important in enriching our understandings on the essentials of KM activities; yet do not provide an integrative perspective for actual KM implementation. Another type of KM framework includes those that have been developed by researchers to serve as a basis for examining how KM has been performed in industry. These frameworks provide a reference to facilitate the structuring, analysis and evaluation of the KM initiatives undertaken in various case companies. The frameworks developed by *Apostolou and Mentzas (1998)* and *Lai and Chu (2002)* fall into this category. The literature review has highlighted a further type of high-level KM framework. These are the ones that provide more detailed directions on the implementation of KM.

Table 2.2 Frameworks & Models for Knowledge Management Implementation

Researcher	Framework and Model
Rubenstein. (2001)	Perform strategic plan, perform business need analysis, conduct cultural assessment and establish, performance conceptual modeling, perform physical modeling, capture and secure knowledge, represent knowledge, organize and store knowledge in the knowledge management system , combine knowledge, create knowledge and share knowledge
McCampbell et al. (1999)	Form powerful coalition, Communicate vision of KM, Establish teams for needs assessment, Analyze the needs of KM, Identify and collect knowledge, Design a technological structure to warehouse knowledge, Test the technology, Maintenance of the technology, Retest the technology, Training of knowledge workers, Roll out the use of KM practices, Track usage, Make systems go live, Measure quality and productivity, measure the performance of KM practices, conduct a need assessment review.
Wiig (1998)	Build management understanding and commitment to pursue KM, Map perspectives of the knowledge landscape, Plan the organization KM priorities, focus and strategy, Identify sought KM benefits, Adjust KM priorities and Create KM-related incentive programmed.
Wiig (1999)	Obtain management buy-in, Survey and map the knowledge landscape, Plan the knowledge strategy, Create and define knowledge-related alternatives and potential initiatives, Portray benefit expectations for knowledge management initiatives, Set knowledge management priorities, Determine key knowledge requirements, Acquire key knowledge, Create integrated knowledge transfer programmes, Transform, distribute and apply knowledge assets, Establish and update a KM infrastructure, Manage knowledge assets, Construct incentive programmers, Coordinate KM activities and functions enterprise- wide, Facilitate knowledge-focused management and Monitor knowledge management.
Chase,R.L.(2000)	Success in establishing an enterprise knowledge culture, top management support for managing knowledge, ability to develop and deliver knowledge based goods/services, success in maximizing the value of the enterprise is intellectual capital , effectiveness in creating an environment of knowledge sharing, success in establishing a culture of continuous learning, effectiveness of managing customer knowledge to increase loyalty/ value and ability to manage knowledge to generate shareholder value
Junnarkar,B.(1999)	Connecting people with other knowledgeable people, Connecting people with information, Enabling the conversion of information to knowledge, Encapsulating knowledge, to make it easier to transfer and Disseminating knowledge around the firm
Dataware Technologies,Inc.(1998)	Identify the business problem, Prepare for change – obtain executive support and make the shift to a sharing culture, Create the team, Perform a knowledge audit – identify , Define key features required for the technological infrastructure, Phase in knowledge management and Link people to knowledge- knowledge directory and content management
Xerox Corporation (1999)	Discovery – identify business goals, challenges and opportunities, Definition – determine key requirements and scope of the project, Start - up – detailed project plan is developed, Delivery – implement the plan, Evaluation – ensure results meet expectations and facilitate knowledge transfer

APQC(1996) (American Productivity & Quality Center)	Getting Started, Explore and Experiment, Pilots and KM Initiatives , Expand and Support and Institutionalize KM
McElroy 2007	knowledge management , knowledge processes and Business processes
Liebowitz (2000)	Identify and verify knowledge, Capture and secure knowledge, Organize knowledge, Retrieve and apply knowledge, Combine knowledge, Learn knowledge and Distribute/sell knowledge.
Liebowitz & Backman(1998)	Identify knowledge, Capture knowledge, Select knowledge, Store knowledge, Share knowledge, Apply knowledge, Create knowledge and Sell knowledge
Frid (2002)	A pragmatic guide to building a knowledge management program
Frid (2003)	A common KM framework for the Government of Canada: framework for enterprise knowledge management
Stankosky (2005)	Creating the discipline of knowledge management: the latest in university research: This model appears to be a developing methodological framework, rather than a single model, and is the subject of continuing doctoral research at the George Washington University.

The KM frameworks that have been presented in the literature tend to focus on different aspects of KM and have different purposes. Among them, the most notable includes the knowledge creation framework developed by Nonaka (1994) and Takeuchi (1995), which describes how the evolution and conversion between explicit knowledge (characterized by its ability to be codified or put in writing) and tacit knowledge (which is mostly people bounded and hard to articulate) can lead to a knowledge creation spiral in an organization. Arguably, this is not a KM framework per se, as it only deals with the creation of knowledge, which is only a portion of what constitutes KM.

The guidelines proposed in this paper for developing a KM implementation framework are as follows:

- KM Strategy
- Leadership Behaviors
- Networking
- Learning before, during and after
- Capturing knowledge

2.3.2 SERVQUAL Method

SERVQUAL used to measure and manage the quality of service by distributing questionnaires that measure both customer expectations for quality of service in these five dimensions and their perception of the service they receive. As customer expectations are greater than their perception of the service quality is considered low.

This method was developed by *Zeithaml, et.al., (1990)* using a manual approach based-approach, which quantitatively measure service quality in the form of a questionnaire and contains the dimensions of service quality, namely tangibles, reliability, responsiveness, assurance, and empathy.

This method is divided into two parts, namely:

1. Section expectations, which contain questions to ascertain the general expectation of the consumer to a service.
2. Section perception that contain questions to gauge consumer perceptions of the companies in specific categories.

Then the consumer gives weight to the interests of each dimension there.

Zeithaml, et.al.,(1990) developed a conceptual model of service quality that is embodied in five gap (the gap) services as illustrated in the following figure.

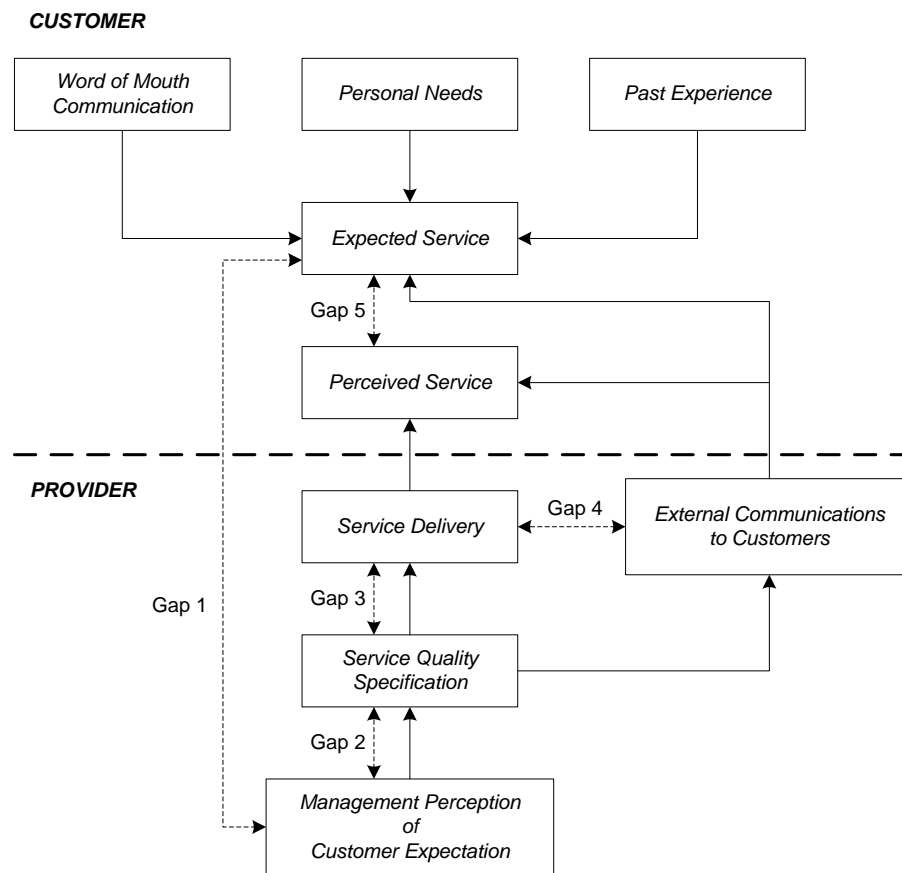


Figure 2.4 Conceptual model of Service Quality (Zeithaml, et al., 1990)

1. Gap 1: Not knowing what customers want
- Gap 1 shows the difference between customer expectations with perceptions of companies about customer expectations. The main factors that affect the gap 1 is as follows:
- a. Lack of orientation on market research, e.g. lack of market research, lack of use of research results, and the lack of interaction between the management with customers.
 - b. The lack of upward communication, such as company employees who deal directly with customers less interaction with the management.
 - c. Too many levels or levels of management so as to extend the communication range.

2. Gap 2: Error selecting service quality standards

Gap 2 shows the difference between the perceptions of the company regarding customer expectations by setting service specifications.

The main factors that affect the gap 2 are as follows:

- a. Lack of management commitment to service quality, for example: the lack of commitment of employees to increase service quality, lack or absence of internal programs to improve the quality of service to customers.
- b. Perception of infeasibility, for example: the capability of companies that cannot meet the demand of customers on service quality, nonconformity existing operating system with customer expectations, the lack of the ability of employees to deliver the level of customer service requested.
- c. Lack of standardization work, for example: the lack of automation in maintaining consistency in serving customers.
- d. The absence of goal-setting, such as the absence of a formal process used in establishing clear objectives.

3. Gap 3: Gaps service performance

Gap 3 shows the difference between service quality specifications defined by the process of service delivery to customers.

The main factors that affect the gap 3 as follows:

- a. The ambiguity of the role which shows the extent to which employees can perform tasks according to the expectations of the manager but also can satisfy the consumers
- b. Role conflict which shows the extent to which employees believe that they did not satisfy all those whom it serves.
- c. Conformity employees with the work they do.
- d. The suitability of the technology used employees
- e. System control from above showing the assessment system and inadequate reward system.
- f. Perceived control shows the extent to which employees' flexibility in determining the ways of service.

g. Teamwork showing the extent to which employees and management to formulate a common goal to satisfy customers together and integrated.

4. Gap 4: Non-compliance with the promise given service

Gap 4 shows the difference between the qualities of services given by the company with the statements made by a company through marketing communications.

The main factors that affect the gap 4 as follows:

a. Inadequate horizontal communication, such as lack of communication between the advertising or promotion of the production, the lack of communication between the sales operations, lack of communication between the human resources, marketing, and operations, policies and procedures and the differences between divisions or departments.

b. The tendency of companies to provide excessive promises.

5. Gap 5: The gap between perceptions and expectations of customers

Gap 5 shows the difference between perception and customer expectations regarding service quality. Gap 5 is a model of the expanded gap (extension gap 1 - gap 4). The gap between perceptions and expectations of customers is the result of the fourth gap, found in the company's organization. The following image shows the model gap expanded to the quality of services.

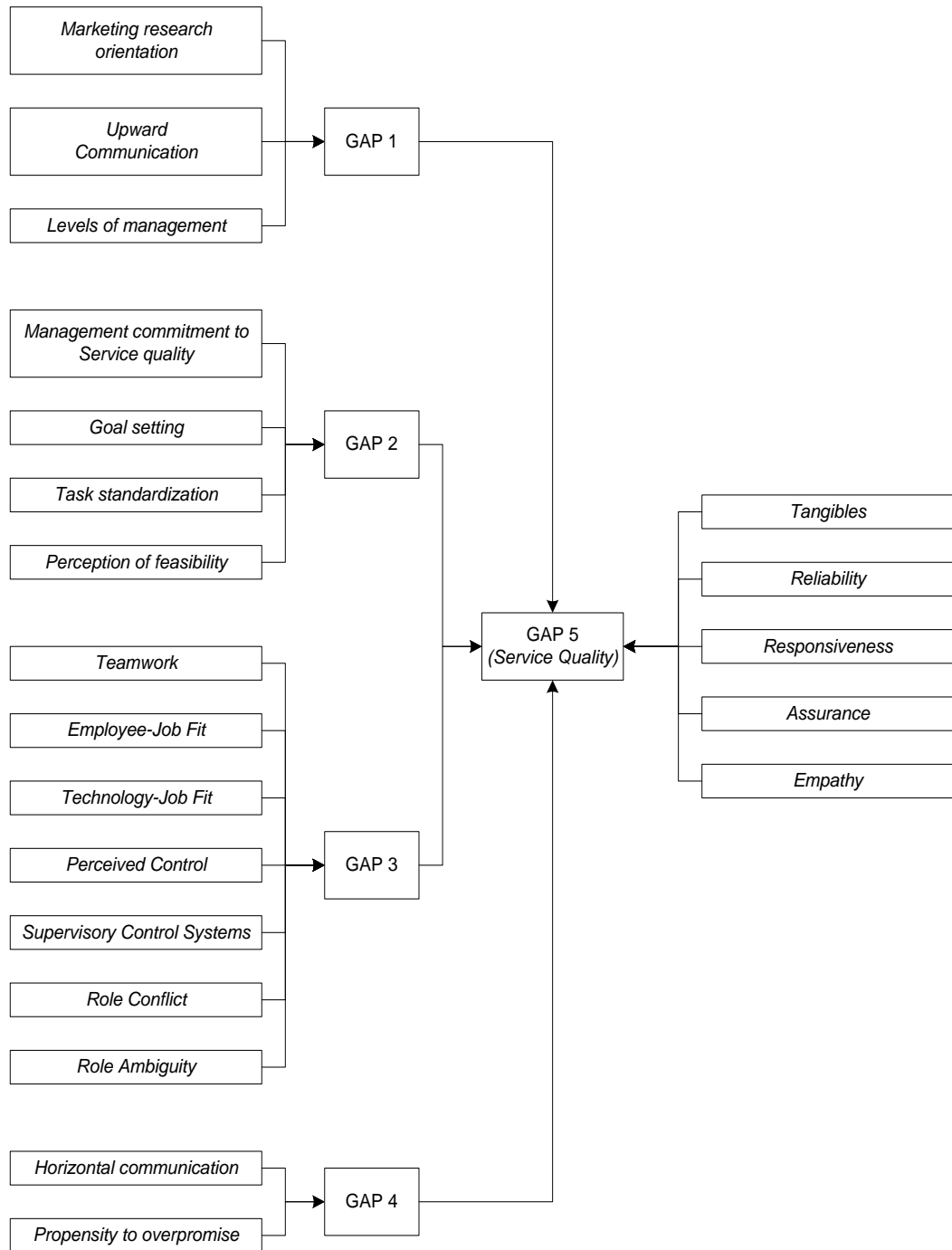


Figure 2.5 The Extended Gaps Model of Service Quality (Zeithaml, *et.al.*,1990)

2.3.3 QFD Method

According to *Cohen*, QFD (Quality Function Deployment) is a method for structuring the planning process and product development, and allows for detailing the customer's wants and needs clearly. QFD can also be interpreted as the spread of the functions associated with the development of products and services with quality that meets customer satisfaction (*Reville, Frigon and Jackson, 1995*). QFD in reality is a series of components that do not all require the presence of specific applications.

According to *Cohen, L (1997)*, the main tool used in QFD in 4 points:

1. Affinity diagram is a hierarchy that is built from the bottom up (bottom-up) and the connection between ideas based on intuition of a team making.
2. Tree diagram, as well as affinity diagram, is a hierarchical structure of ideas. The real difference is the tree diagrams is built from the top down (top down) and use the process of analysis and logical reason. Process affinity diagrams and tree diagrams are usually used together in unity. First, affinity diagrams are used to create the proposed hierarchy of data rude. Second, the process tree diagram used to supplement and re-structuring to produce a better structure.
3. Matrix diagram, providing relationship mappings between the two parts of the idea / item or concept.
4. Prioritization matrix provides a way of expressing the forces of relationships that have been built on a matrix diagram, using the values of numbers and graphs in matrix cells. Finally, by transferring the weight of the items on the left with the value of the strength of the relationship will get the priority value of items that are located on the top of the matrix.

According to *Dale (1990)* the benefits of QFD are:

1. Improving the quality
2. improve the performance of the company
3. Improve customer satisfaction.

4. Improve time to market
5. The low cost in the design and manufacturing
6. Improving the reliability of the product
7. Reduce planning time
8. Improve engineering productivity and staff
9. Reduce complaints and warranty
10. Improving market opportunities
11. Improving profitability
12. Develop decision-making process (decision making)
13. Improving communications.

According to *Kenneth Crow (1999)*, based on the QFD method engineering approach to the system consisting of the following general steps:

1. Get a top-level product requirement or the technical response of the needs of consumers (Product Planning Matrix).
2. Develop product concepts to satisfy these needs.
3. Evaluate product concepts to determine / choose the most optimal (Concept Selection Matrix)
4. Divide in parts of the system concept (Assembly / subsystems) and then lower the higher-level requirements or technical response to these subsystems.
5. Getting a lower-level product requirements (assembly or part characteristics) and specifications from subsystem (Assembly / Part Deployment Matrix).
6. To Critical Assemblies, later revealed to be lower-level product requirements (Assembly or Part Characteristics) for the booking process.
7. Determine manufacturing process steps that correspond with the assembly or part characteristics.
8. The basic of this process step is the initial needs, process control and quality control to ensure the attainment of Critical Assembly or part characteristics.

According to *Cohen (1995)* most organizations use QFD stopped after reaching the HOQ. One of the reasons why QFD is not used as a whole is due to

the lack of specificity as well as firmness in the existing literature, such as how to use downstream QFD matrix. According to the *Monroe-Faure (1996)*, the principal tool that using in QFD is HoQ (House of Quality) is a matrix showing the relationship between the customer's needs with technical response.

Quality Function Deployment (QFD) is a method in the process of development of products / services that serve to translate the desires of consumers to the desire of the company correctly. QFD is then linked to internal processes, such as product planning. QFD is known in the product development process there are two types: QFD 1 and QFD 2. QFD 1 is often called House of Quality (HOQ). House of Quality is a diagrammatic representation of products / services attributes therein, consumer desire, and the ability of the company. In HOQ done by changing consumer needs into technical response that will be developed. Then do weighting process on the technical response of the most influential to enter into the next stage of the process. In determining the technical targets, need a comparison that technical benchmarking of existing products in the market during this time. In addition to technical benchmarking, should also be specified position of a competitor's product against other products in view of the consumer, so that the determination of the target as a result of an analysis of the technical benchmarking becomes valid. Here it is assumed that the reference product is a competitor product that became the basis of new product development. Having obtained the technical response is considered important along with targets and weight then do step design. After selecting the product concept is based on the criteria proposed by the consumer and manufacturing, then do the next product design process is to make QFD. At present QFD 2, the technical response that have been made are then converted into part response of each component part of the selected product concept. At this stage it will also be determined targeting of character parts.

QFD method based on the development of serial matrix called *House of Quality*. This matrix called *House of Quality* due to its structure like the roof of the house, and this house is divided into rooms as of below:

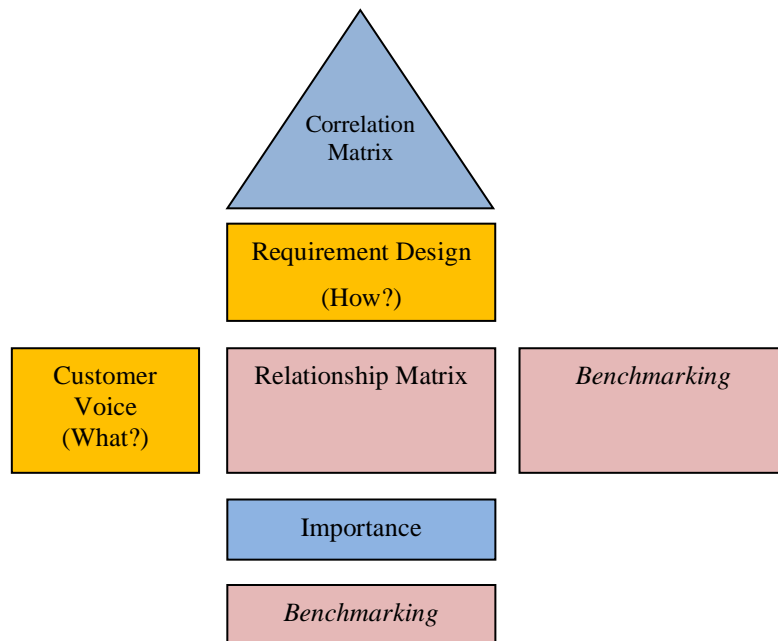


Figure 2.6 House of Quality (Bernal, 2009)

About house of Quality:

1. Voice of Customer
QFD starts with the establishment of objectives, which answers the question “What?”. What desire to achieve the development of new services? These objectives are derived from the requirements of clients and called the voice of the customer.
2. Design Requirement
After completing the needs of the client, next step is to construct "How?", to determine how the need of each client can be satisfied with the service. This is a measurable feature that can be calculated and evaluated in the end of the development process.
3. Relationship matrix
The relationship between the client's needs and the design is not always one to one. Sometimes there is a complex relationship and the different levels of strength. One single design requirements can have an influence on some of the client's needs.
4. Benchmarking

QFD technique allows the assessment of competitors. Benchmarking is done for "What" and "How" the services along the lines of both companies compared to client requirements.

5. Level of Importance

The level of importance expressed relative significance of each client and design requirements to achieve the desired goal. Significance of customer needs established through the evaluation by the customer.

6. Correlation Matrix

The correlation matrix is triangular table. "How" is integrated with build correlations between all elements. This matrix illustrates the strength of relationship between the requirements of the design. Aiming to identify the requirements which support one another and which are not favorable.

2.3.4 TRIZ (Theory of Inventive Problem Solving)

TRIZ is the acronym of the Russian language, Teoriya Resheniya Izobreatatelskikh Zadatch. Translated in English became "Theory of Inventive Problem Solving". TRIZ is the result of analyze whole world of technological innovation as a description to most creative literature patents. This analysis has been carried out over a period of 50 years with the total number roughly 3 million of patents analyzed (*Skrupskis and Ungvari, 2000*). TRIZ were applied in the industry, as the replacement of of trial-and-error method that does not have systematic problem solving.

TRIZ developed by G.S Altshuller and his colleagues from Soviet Union. TRIZ is a philosophy of technology, method of science and technology, a systematic way of thinking for development of creative ideas, a system which includes knowledge of technology, software for databases, and others. Long story short, TRIZ provides great principles and tools that concrete for creative thinking in a series of technology (*Nakagawa, 2004*).

In TRIZ there are number of methods to analysis, among others are:

1. **Clarifying the opportunity** - to collect all relevant data for analysis and to focus on the right opportunities, not only a symptom.

2. **Analysis function** - take a single problem statement and through the use of statements that related to cause and effect, generate a comprehensive list of issues more explicit. The purpose of functional analysis is simplification, the trend in design development with number of parameters that decline, but not less than the number of functional purposes.
3. **Algorithm for Inventive Problem Solving (Ariz)** - TRIZ has develop a troubleshooting procedures in which analyzing the problems to formulate the technical contradiction, then reformulate into a physical contradictions, and finally resolve the issue with the principle of separation. This procedure is called Ariz; an alternative steps to develop definition of problem that has more difficult issues.
4. **Analysis of Substance - Field** - modeling the problem to the components through new thought based on structure of the system and the source. The solutions are useful for sharing a case of Substance - Field Model has accumulated and compacted into "76 Inventive Standard Solution".

In *Quality Engineering* (2008) describes the Knowledge-based tool shows the main observations made by fixing Altshuller on the efficiency and effectiveness of contradictions and evokes breakthrough inventive concepts. All equipment of TRIZ knowledge-based produces a concept that requires a change in practical solutions to satisfy the needs of specific issues.

1. Pattern / Prediction Evolution

This is the description of a series of possible design to certain design. One prediction, for example, describes the development of system from the macro level to micro level. To create a product or service to compete, it is important to forecast future conditions for similar functional design. This is usually done through analogy and exploration methods. Development of functional design requirements are tested and plotted to evolution of S-shaped curve then made a conclusion on conceptual alternatives that allow from development, with appropriate consideration given to evolutionary tendencies and different design parameters.

2. The principle of contradiction

The contradiction between the two design performance parameters can be solved using one or more of 40 basic innovation. Basic usage of the successfully 1263 contradictions is shown in a contradiction matrix. To represent the condition of this technical contradiction, TRIZ has selecting 39 system parameters and provides a matrix problem size 39 x 39, then surveying a large number of patents, each patent analyzed to discover which type of technical contradictions (between 39 x 39) and which principles of invention are the most widely used in each type of 39 x 39 issues. 4 top principle in each type of problems are noted in the form of a table of 39 x 39 elements, result of the table are called " Altshuller Contradictions Matrix".

3. Principle of Separation

The inherent contradiction, sometimes called physical contradictions, the simultaneous occurrence of two conditions separated from one another which can be solved using the principle of separation.

4. Standard Solution

Is a generic system modification to a model developed using Su-Field analysis ("76 Inventive Standard Solution "). These solutions can be categorized into 5 main categories;

- a) Improve the system with little or no change - 13 standard solutions
- b) Improve the system by changing the system - 23 standard solutions
Transition system - 6 standard solutions
- c) Transition system - 6 standard solutions
- d) Detection and measurement - 17 standard solutions
- e) The strategy for simplifying and improving - 17 standard solutions

5. Effect

An effect is a physical act that generates an object a basis or any other action as a consequence. As a general rule, this is a phenomenon associated with product design.

6. Operator System

When analyzing function model after clarifying opportunities step, we can approximate the model from three views or strategy. The strategy as of following:

- a) Eliminate harmful effects,
- b) Eliminate excessive action, and
- c) Enhancing the beneficial action

Features available on TRIZ can be summarized as follows (*Zhang, et al., 2005*):

1. TRIZ helps raise the ideal quality in the systematic and efficient shape.
2. TRIZ help resolve psychological problems by formulating possible solutions.
3. TRIZ supports thinking without trade-offs.

When Genrich Altshuller completed basic research of world patent, he made four main observations (*Quality Engineering, 2008*):

1. There are five levels of invention:
 - Level 5 : Finding a new phenomenon
 - Level 4 : Invention outside design paradigm requires new technology from different fields of knowledge
 - Level 3 : The discovery in the design paradigm requires the completion of a physical contradiction.
 - Level 2 : Improvements to the invention requires completion technical contradictions
 - Level 1 : The real solution (no innovation) result in simple improvements.
2. Inventive problems contain at least one contradiction. Altshuller introduced that the same design including contradictions are addressed by a number of discoveries in the different industrial area. TRIZ create a form that represents

the core problems, which is technical contradictions, and provide a hints in the form of table for solutions. Technical Contradiction is case where if we try to improve an aspect (or parameters) of systems, other aspects will decline. He also observed the repetition use of same basic solutions is often separated in several years. Altshuller concluded that if the next designer has knowledge of previous solutions, actions of designers should be simplified.

3. The same principle is used in some inventive design because it can be considered as a pattern solution. Inventive principle is the best practice that has been used in some application and quoted from several industries.
4. There is a standard pattern for development. To create a product or services, it is important to predict and make analogies for the future situation on the same concept. Previous development from the design are tested and applied to predict the future design that going to be studied.

Altshuller sure that every idea / invention have the same basic shape that he observed more than 40 years until producing TRIZ.

1. "40 Inventive Principles"

"40 Inventive Principles" is made by finding a variety of information from various patents. Almost all of the principles have sub-criteria and illustrated with a case for reference.

2. Contradiction Matrix

The contradiction design between two parameter of performance can be solved using one or more of 40 basic innovations. Basic usage successfully use for 1263 contradictions is shown in a contradiction matrix. To represent the condition of this technical contradiction, TRIZ has selecting 39 system parameters and provides problem matrix by 39 x 39. Then, with a survey of large number of patents, each patent analyzed to discover which type (between 39 x 39) of technical contradictions and where the principle of discovery of most widely used in every type of 39 x 39 problems. Top 4 principles on each type of problems are

recorded in a table of 39 x 39 elements; the results table called "contradictions Altshuller Matrix".

3. Knowledge Base of Physical Effects

An effect is a physical act of an object that generates basis or any other action as a consequence. This general rule is the phenomenon associated with product design

4. Knowledge Base for Finding Means from Target Functions

In technology, we often find some way to run something that we want. TRIZ create a hierarchical general system to represent the wishes and organize technology and knowledge in the system.

5. Knowledge Base of Trends of Evolution of Technical System

Table 2.3 Systematic Innovation through TRIZ (Zhang, *et al.*, 2003)

1.	Segmentation	21.	Skipping
2.	Taking out	22.	“Blessing in disguise” or “Turn Lemons into Lemonade”
3.	Local quality	23.	Feedback
4.	Asymmetry	24.	“Intermediary”
5.	Merging	25.	Self service
6.	Universality	26.	Copying
7.	“Nested Doll”	27.	Cheap short-living objects
8.	Anti weight	28.	Mechanics substitution
9.	Preliminary anti action	29.	Pneumatic and Hidraulics (Intangability)
10.	Preliminary action	30.	Flexible shells and thin films
11.	Beforehand cushioning	31.	Porous materials
12.	Equipotentiality	32.	Colour changes
13.	The other way round	33.	Homogeneity
14.	Spheroidality	34.	Discarding an recovering
15.	Dynamics	35.	Parameter changes

16.	Partial or excessive action	36.	Phase transition
17.	Another dimensions	37.	Thermal expansion (Strategic expansions)
18.	Mechanical vibration	38.	Strong oxidants (Boosted interaction)
19.	Periodic action	39.	Inert Atmosphere
20.	Continuity of useful action	40.	Composite material

2.3.5 Correlation TRIZ and QFD

QFD role to TRIZ, TRIZ methodology enhanced by using voice of customer is to make innovation process and design. QFD provides process to identify the needs of consumers.

TRIZ role to QFD, QFD do not offer assistance in creating alternative design. QFD is processing the perfect job in prioritizing the issues that to be resolved. Modern TRIZ offers the most efficient tool for creative and innovative solutions that difficult to be solved using QFD concept. TRIZ is close to the problem solving that related with the satisfaction as QFD needed. Regularity discovered by Henrich Altshuller applied to all systems that exist in the organization.

The relationship between TRIZ and QFD introduced in two format. The first is using model "Step-by-step QFD" (five steps) with classical TRIZ. Classical TRIZ is a combination of science and art. The second, with *ideation* methodology that integrates the different perspectives that offered in classical TRIZ entirety incorporated.

In this study, the authors use QFD method to locate the problem, and then use the TRIZ method for solving the problems related to services to its users in PT. A.

2.2 State of Art on Previous Research

This research conducted based on theories derived from various sources, both from previous studies and literature. The focus is Supply Chain, Knowledge

Management, QFD and TRIZ becoming the reference to improve the quality in purchasing department of contract & procurement division PT.A. Long story short, the elaboration of the State Of The Art (SOTA) on previous research can be seen in Table 2.4 below.

Table 2.4 Previous Researches

No	Researcher	Years	Title of the Research	Type of Research					Industry	
				Purchasing	KM	Servqual	QFD	TRIZ	Industry	Sub
1	Su, Chao., Lin, Chin., and Chiang, Tai	2008	Systematic improvement in service quality through TRIZ methodology						IT	e-Commerce
2	Jafari, Mostafa., Akhavan, Peyman., and Mortezaei, Ashraf	2009	A review on Knowledge Management discipline						Education	University
3	Shaozhong, Yu., Wei, Xiong., and Zhixin, Wu	2009	Research on the Application of QFD and Knowledge Management in the Outsourcing Software Quality Assurance						IT	Purchasing
4	Pouckea, Eline., Weelee, Van., and Matthyssensa, Paul	2011	The interrelationship between purchasing maturity, internal customer satisfaction and purchasing performance						Manufacture	Purchasing
5	Emir Andromeda Wahju	2013	Analisa Persepsi dan Harapan Penghuni Perumahan Terhadap hasil Pemeliharaan dan Pelayanan						Oil and Gas	General Services

6	Gazem, Nadhmi., and Rahman, Azizah	2013	Improving TRIZ Inventive Principles Grouping in Redesign Service Approaches						Education	Intellectual Property
7	Mileide Morais Pena	2013	The use of the quality model of Parasuraman, Zeithaml and Berry						Health	Hospital
8	Rizaldi Yudistira	2015	Analisa Kepuasan Pelanggan terhadap Pelayanan. Perusahaan Jasa Inspeksi Teknis						Engineering	End User
9	Nantapatr Vorasaiharit	2016	Integration of SERVQUAL Model with Quality Function Deployment						University	Library
10	Hendra Wahyudi	2016	Service Quality Analysis and Improvement of Purchasing Department in Oil and Gas Industry (Case Study: PT.A)						Oil and Gas	Purchasing

The Research Study on the Systematic improvement in service quality through TRIZ methodology by *Chao, et. al., (2008)*. In the study, the researchers' Attempt to extend the TRIZ methodology to a broader application in a non-technological area. The problems related to the company's services online database application development in Taiwan. A systematic framework based on the TRIZ methodology is proposed, and a case study involving an e-commerce company is used to illustrate the applicability of the framework in terms of service quality improvement. Aside from this, in order to improve the effectiveness of the conventional TRIZ problem-solving process for its practitioners, a parameter corresponding table is developed to provide an efficient way of applying the TRIZ contradiction matrix to resolve service problems. Through the practical result of the case study, the valuable contribution of the TRIZ methodology in the service industry is further obtained.

Refer to *Mostofa, et.al., (2009)*, the review on Knowledge Management Discipline provides organizational roles to implement knowledge management. The focus is on how to devise and implement knowledge management where it is required and provides a common understanding about KM in implementation area. Also provides a general review on KM systems, KM architecture, KM process, KM strategy and KM critical success factors. Using the River Model, result of this study is on Knowledge-focused activities permeate any knowledge-enabled organization; in other words, implementing KM involves, among other aspects, setting up processes and systems to enable the activities. From an implementation view of process design managers, the knowledge processes are individually too unstructured to be simulated by KM implementing infrastructure. However, applying a cyclic approach of knowledge processes, the individuals and groups may be considered in one domain of organizational segregation to suit KM implementation.

For the implementation of QFD and Knowledge Management are refer to *Yu, et.al., (2009)*. This study is researching on the Software Development. The requirements change has become a great challenge, in order to control requirements change more effectively, it is necessary to extend or improve the traditional Quality Function Deployment (QFD) method. Thus, on the basis of model of SECI a new methodology called Dynamic Quality Function Deployment (DQFD) is put forward in this study. Then, combining with the software structure design method of Quantification Method of Type 3, DQFD is applied to control requirements change, Concretizing the theory and method of Knowledge Management (KM) and an approach called software requirements change management based on DQFD is proposed. The applicability and validity of the proposed approach are testified through its application to an actual software development project, and these results further consummate the theory framework.

The interrelationship between purchasing maturity, internal customer satisfaction and purchasing performance (*Eline, et.al., 2011*), using the Kraljic Matrix, the aim of the study is to investigate the interrelationship between purchasing maturity, ICS (Internal Customer Satisfaction) and purchasing performance. Thereby the moderating roles of purchasing category and internal

customer differentiation are integrated. The current study is motivated from the observation that no insight into the interrelationship of purchasing maturity, ICS and purchasing savings exists. In addition, preceding research on purchasing development, ICS and purchasing performance has primarily focused on the purchasing function or firm level. Thereby, differentiation among internal customer departments and purchasing categories has not been explored and reported on. The current research addresses these gaps by means of a quantitative, empirical study within one company whereby relationships are investigated at the purchasing project level. This research project is a first study of a larger research endeavor to investigate the interrelationship between purchasing maturity, ISQ (Internal Service Quality) /ICS (Internal Customer Satisfaction) and purchasing performance. It uncovers a large and unexplored intra-organizational research field within the scope of purchasing development, which on its turn has been approached from a rather conceptual point of view so far. Inspiration can be provided on the importance of purchasing development with respect to the department's internal service and cost reduction performance for different purchasing categories. The results of the study provide insight on the importance of purchasing development with respect to purchasing performance. Also, inspiration will be provided to purchasers on the customization and management of internal service performance.

The study on the Oil and Gas Study that related with the Service Quality of its internal customer are referring to *Wahju (2013)*. The study intends to analyze the quality of the service from general services to its internal company user, by identifying dimensions of service quality which is significant for the housing compound. It is to determine whether there are differences regarding the dimension expected and received, also to know which dimension is the best predictor of the overall value of Service Quality. The services provided to each occupant of general services are the factors to be studied in depth. Analysis was done thru perceptions of occupants to its service and gap between expectations and reality of the service perceived by the occupants. The method use in the research is analysis of five dimensions of SERVQUAL consisting of dimensions

Reliability, Assurance, Tangible, Empathy and Responsiveness. The data obtained from a questionnaire survey conducted to the residents, using a Likert scale 1-7.

Refer to *Nadhmi, et.al., (2013)* reviewed the theory of inventive problem solving (TRIZ), focused on the 40 inventive principles because this tool is commonly used for solving contradiction problems. The research enhanced the previous work for grouping 40 IPs (Intellectual Property) according of different types of redesign service approaches. The grouping process in this study basically depended on a new interpretation of the principles from the service prospective. Hints that developed with each principle have been used as mean in the process of mapping between 40 IPs and SRA (Service Redesign Approach) characteristics. The new grouping enhanced the previous results by adding new principles into or eliminating the weak coloration principles within a particular SRA characteristic. This study showed that various principles could be used in different approaches to redesigning services. Furthermore, some principles can be used repeatedly in a particular service approach. The repetition of principles in each service approach illustrated the most inventive principles that should always be considered to improve any of the service approaches. The comparison result showed that using the grouping tables provide more corresponding inventive principles than those provided by applying TRIZ matrix.

For the implementation of SERVQUAL and QFD are refer to *Mileide Morais Pena (2013)*. This study about the theoretical model for assessing quality in health services proposed by Parasuraman, Zheitaml and Berry, in order to measure the degree of satisfaction of users. This model is based on the analysis of expectations and perceptions of users of health services, by means of five dimensions: tangibility, reliability, responsiveness, assurance and empathy. From the difference between what is expected by the user and the service offered, gaps or shortcomings are derived that may be the main obstacle for users to perceive the provision of such services with quality. It was observed that the use of the psychometric scale called Service Quality (SERVQUAL). The employment of an evaluation model developed in the context of marketing and applied to the area of health demonstrates the growing concern of health institutions and professionals themselves regarding user satisfaction.

The study of Service Quality referring to *Rizaldi (2015)*, the research is subject to PT Valarbi a Technical Inspection Services Company. Declining number of new customer is the problem of service quality that must be addressed by the management. The purpose of the study was to determine the compatibility between expectations and the actual service quality received by the customer PT Valarbi. The service quality is measured by Method Servqual, with 50 Respondents. Correspondence between expectations and reality were analyzed using Model Cartesian diagram and main priorities that need to be addressed were analyzed using the Quality Function Deployment (QFD).

Refer to *Nantapatr (2016)*, the review on Integration of SERVQUAL Model with Quality Function Deployment. This study integrates SERVQUAL model and Quality Function Deployment (QFD) for this design purpose. 19 questions were created in Likert Scale to measure customer expectation and perception. Mean difference between expectation score and perception score were calculated, analyzed and tested their statistically significant at 95% confident interval. House of Quality is in charge of translating customer requirement to technical requirement as a way to design new library.

Research that conducted by *Wahyudi, Hendra (2017)* is novelty on the application on Service Quality in Purchasing within Oil and Gas Business, with amalgamation method from previous research that expected to get proposal for improvement. Nature of this study are Service Quality, the service quality method using five dimensions of SERVQUAL with attributes on perception and expectation of service quality. Data are taken from the sample using questionnaire distributed to the user that uses the service. For analysis, first step using River Model to identify the category of service quality that have the biggest gap between target and actual. Then from the biggest gap of category in River Model then using Quality Function Deployment (QFD) is to determine the attribute that affecting the most quality of services and final step using TRIZ (Theory of Inventive Problem Solving) to propose the solution as per required needs. The expected result on this research is to be able to identify and give improvement based on users' desire.

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CHAPTER 3

RESEARCH METHODOLOGY

In this chapter, the research methodology will be elaborated by gathering or testing knowledge and the chosen approach in this nature of research, by conducting survey. This chapter presents the research method, type of data, data collection technique and research plan diagram.

The survey research is done by taking sample from population with the help of questionnaires, as a data collection tool. Data mining can be collected through questionnaires, interviews, and document data. The planning on distributing the questionnaires in this research is going to be in two ways: through face to face meeting with concerned parties and via email. In addition to use the questionnaires, this research also using interview to level of strategic functions to obtain more detailed information regarding the risks. Previous studies will also be use to help the researcher to identify the risks that might arise. Some of those literatures are papers, journals, research reports, and books.

3.1. Research Steps

In this flowchart, present the stages of research, conducted by the problems that already existed, covering the stages of Identification, Data Collection and Processing, and Analysis and Conclusion, as set out in the figure as of following:

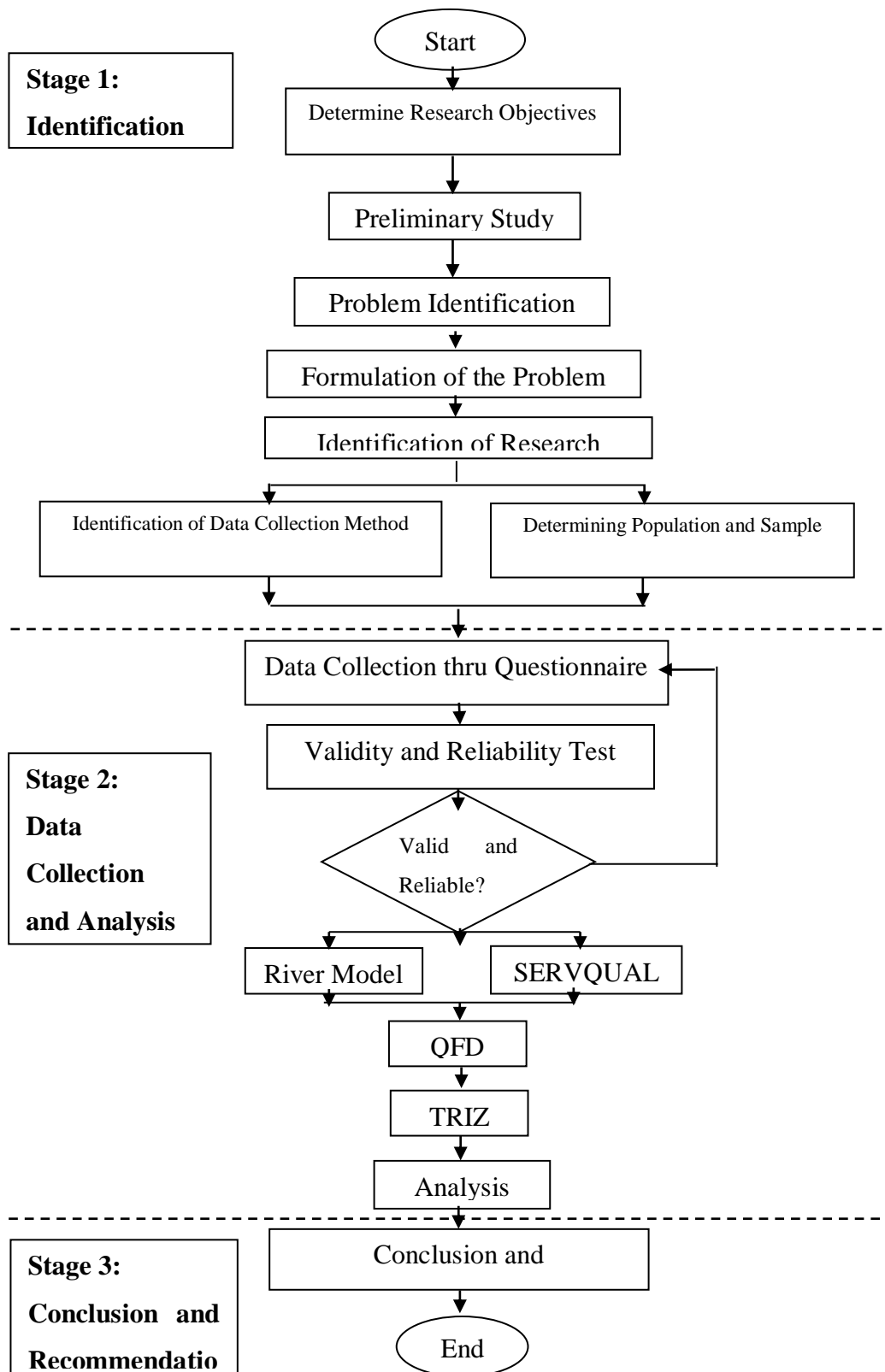


Figure 3.1 Research Steps

3.2 Stage 1: Identification

1. Determine Research

The purpose of this study is to determine what service quality influences user satisfaction thru survey-based method. The research takes sample within internal customer due to the nature of service and using questionnaires as the primary means of data collection. However the respondents are limited within the company of PT.A, as the nature of the business, often become barrier to improve service quality. By having these dimensions, it is expected what subject in the dimensions to be prioritize for improvement. So with the allocation resources, what priority of service quality that needs to be improving from Purchasing Department, as stated in Contract and Procurement yearly objective.

2. Preliminary Study

Preliminary study aims to have solid ground work and to define the theoretical framework regarding Service Quality faced in Purchasing Department at PT.A. Some literature materials used for this research is a journal, papers, books about Service Quality, Knowledge Management, QFD (Quality Function Deployment), TRIZ and procurement processes.

3. Problem Formulation

Formulation of the problem is an attempt to formulate or to systematically modeling the phenomena that exist in real world, on existing theories. The problem that to be solved is the measurement of user satisfaction with the services provided by Purchasing Department, whether the quality of service offered to the user are met their expectations or not. Therefore, the examination of service quality to user of Purchasing Department can be expressed in a model, as follows:

$$\text{Service Quality} = f(\text{Perceptions, Expectations})$$

4. Identification Research Variable

The variables in this study are expectation and actual quality of service taken from the five dimensions of SERVQUAL (Tangible, Reliability, Responsiveness, Competence, and Courtesy) and KM Framework of River Model (Strategy, Networking, Learning, Capturing, Leadership) in the Purchasing Department. The sampling technique was determined to the nominee person by Company's NOO (Note of Organization) for the TADM or firsthand user sampling techniques that use the service of Purchasing Department.

The sampling taken from the user objectively in order to received information on the quality of service of the Department of Purchasing based on the expectations and reality received directly.

To determine the sample size, the researcher using Slovin Formula (*Yudistira, 2015*):

$$n = \frac{N}{1 + N.moe}$$

Information:

n = sample size

N = population size

MoE = margin of error or maximum error can be tolerate

The sample sizes (n) of the respondents to this study are:

User WCI	= 2 persons
User LSA	= 2 persons
User HSEQ	= 3 persons
User IST	= 1 persons
User PSP	= 1 persons
Total (N)	= 9 persons

Assuming margin of error of 0.01, the sample size in this study is 8 persons. $n = 9 / (1 + 9*0.01) = 8.26$.

However since the population are small, all the population are going to be surveyed

5. Data Collection Method

Variables study and measurement scale of respondents hopes from Purchasing Department known with structured questionnaire, also the reality is actual service received by the user of Purchasing Department, refer to SERVQUAL as of :

- a. **Expectations and actual direct evidence/ tangible** are compatibility between service expectations and the reality of service received that includes modern procurement system, and real event to support the operations.
- b. **Expectations and reality reliability/ reliability** are conformity between expectation and reality services which includes the capability of the technical person to handle the works that includes fastest procurement, and capacity to handle the works.
- c. **Expectations and reality responsiveness/ responsiveness** are compatibility between expected service and the reality of service received that includes proactiveness and prompt problem solving.
- d. **Expectations and reality guarantee/ assurance** are compatibility between service expectations and the reality of service received that includes skills in the work, and the solutions to every problem.
- e. **Expectations and reality empathy/ empathy/ courtesy** are compatibility between service expectations and the reality of service received that includes willingness to solve the problem of the user.

The methods use in data collection, namely:

- a. Make the Questionnaire

According to *Lubis (1997)*, questionnaire is the means of communication between researcher and respondent / person studied. The questionnaire taken from the respondent in writing and interviews, using questionnaires as guidance in conducting interviews

- b. Do the Interview/ spreads the questionnaire

This method is using the determined questionnaire to the respondent of our user that receives our service.

The questionnaire is referring to Zeithaml (*Delivering Quality Service, 1990*). Determining the value of the statements about the expectations of user would he expect on service quality and customer perception of the services that have been received from Purchasing Department. The questionnaire consist of 5 levels of value range 1, 2, 3, 4, 5.

SERVQUAL Scoring

Table 3.1 Score use in the research.

Score	Meaning of Expectation
1	The meaning of the statement, it is Not Important to me
2.	The meaning of the statement, it is Less Important to me
3.	The meaning of the statement, it is Moderate Important to me
4.	The meaning of the statement, it is Important to me
5.	The meaning of the statement, it is Very Important to me
Score	Meaning of Reality
1	The meaning of the statement, it is not important to me
2.	The meaning of the statement, it is Less Important to me
3.	The meaning of the statement, it is Moderate Important to me
4.	The meaning of the statement, it is Important to me
5.	The meaning of the statement, it is Very Important to me

River Model Scoring

Score	Meaning of Target
1	The meaning of the statement, Awareness
2.	The meaning of the statement, React
3.	The meaning of the statement, Action
4.	The meaning of the statement, Consistently apply
5.	The meaning of the statement, Level Way We Work
Score	Meaning of Actual
1	The meaning of the statement, Awareness
2.	The meaning of the statement, React
3.	The meaning of the statement, Action
4.	The meaning of the statement, Consistently apply
5.	The meaning of the statement, Level Way We Work

3.3. Stage 2: Data Collection and Processing

3.3.1 Data Collection and early Processing

The results of the data collection are summarized and to be further analyzed either descriptively and quantitatively. Furthermore the results of the study are expected be able to determine the expectations and reality of the service quality of Purchasing Department, the techniques for processing data from questionnaire includes:

1) Editing

Examine the completeness of the questionnaire: writing, clarity, conformity, relevancy, and uniformity of data.

2) Coding

Classification of the respondents answer based on the category by marking each answer with a certain code mark.

3) Tabulating

Segmentation of the data accordingly with the purpose for the research and to be included in table that have been prepared earlier.

4) Entry

Assessment of the data is done thru give the scores to the questions. Furthermore are analyzing descriptively and analytically.

Preliminary data are taken from the questionnaires, which were conducted in parallel from the SERVQUAL and River Model. Only if the received data are proven statistically, then it can be use for further process, booth data from River and Servqual method, as an input in QFD. The data from SERVQUAL and River model are going as input in the column of Customer needs and benefit. After the data were taken into account in HoQ, then we are going to have the result of priority of the variables that necessary to be improved. The final steps for data processing, is the variable found from the HoQ that are going to be further proceeding using TRIZ method as innovative solution to improve the current variable that deemed expected to be improving by our customer or end user. For the analysis is going to have the most priority that important by our user and proposal of applicable possible solution.

3.3.2 Validity and Reliability Test

a. Validity test

Validity test is to determine whether or not the questionnaire is valid. A questionnaire considered valid if the question in questionnaire were able to reveal something that will be measured. Therefore validity test is to estimate whether the questions in the questionnaire have been well collated by the researchers and can measure what is to be measured.

In this case, each performs correlation score of questions with a total score, as the hypothesis:

- Ho: score the question that positively correlated with the total score.
- Ha: score the questions that are not positively correlated with the total score.

Validity test of the questionnaire in this study are using SPSS program (Statistics Program for Social Science).

b. Reliability test

Reliabilities test is to measure how far the respondents give consistent answers to the questionnaire. Questionnaire said reliable if someone gives consistent answer or stable over time. Reliability test of the questionnaire in this study are using SPSS program (Statistics Program for Social Science).

3.3.3 River Model

River Model is use to know further on which elements of each attribute data having the greatest gap between target and actual. After the data tested, and if the result of data statistically valid and reliable then the data are input to the River model referring to the following attribute in table below.

Table 3.2 Attribute KM River Model

Variable	Attribute	
	Target	Actual
KM Strategy	<ul style="list-style-type: none"> • The procurement process already included in the business framework and already has tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing • Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up and socialize in the Contract and Procurement Events 	<ul style="list-style-type: none"> • The procurement process already included in the business framework and already has tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing • Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up and socialize in the Contract and Procurement Events
Leadership	<ul style="list-style-type: none"> • Action and responsibility are well define among actors, and each actors are aware their role in the procurement • Personnel capacity to organize, communicate well within internal organization 	<ul style="list-style-type: none"> • Action and responsibility are well define among actors, and each actors are aware their role in the procurement • Personnel capacity to organize, communicate well within internal organization
Networking	<ul style="list-style-type: none"> • There are tools to ease the communication or networking among procurement actors to promptly solving problem • Having the connection from other entities and actively seek to solve the problem 	<ul style="list-style-type: none"> • There are tools to ease the communication or networking among procurement actors to promptly solving problem • Having the connection from other entities and actively seek to solve the problem
Learning	<ul style="list-style-type: none"> • Actively discussed on the problem that exist, and actively seek an answer to the experienced person • Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc 	<ul style="list-style-type: none"> • Actively discussed on the problem that exist, and actively seek an answer to the experienced person • Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc
Capturing	<ul style="list-style-type: none"> • Knowledge on Know-How 	<ul style="list-style-type: none"> • Knowledge on Know-How

	<p>on the operation in OG applied in the procurement process.</p> <ul style="list-style-type: none"> • Knowledge is available just-in-time, user friendly, and well applied. 	<p>on the operation in OG applied in the procurement process.</p> <ul style="list-style-type: none"> • Knowledge is available just-in-time, user friendly, and well applied.
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Each parameter of the KM in the River Model, i.e. KM Strategy, Leadership, Networking, Learning, Capturing are put into the river model as below:

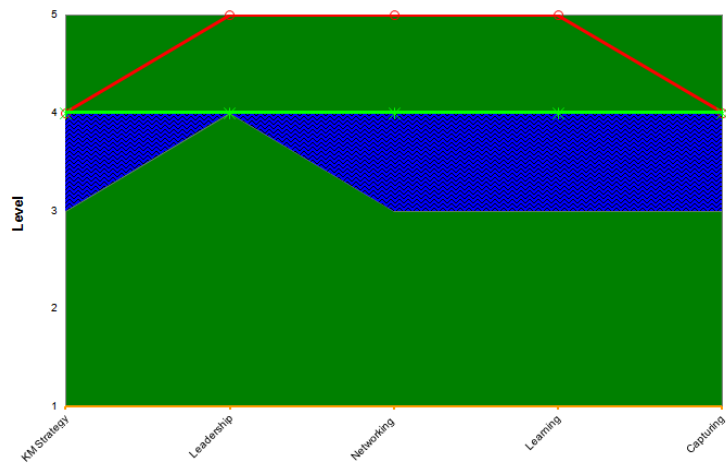


Figure 3.2 River Model

The parameter to evaluate the score of actual and target are define in the parameter of KM River model as below:

Table 3.3 Evaluation Parameter for KM River Model

	KM Strategy	Leadership	Networking	Learning before, during and after	Capturing knowledge
Level 5	Intellectual asset are clearly identified	The leader has been promoting ways of behaving and acting as a true role model	Responsibilities and roles have been clearly defined	Employees regularly to find out who knew and discussion with those who know	Knowledge easy to catch, easy-to-retrieve
(The way we work)	Strategy included in the business strategy in decision making		Network to make sure their time set aside for interaction within the organization	Already have a common language, templates and guidelines that lead to knowledge sharing work effectively	Relevant knowledge driven / delivered to the employees
Level 4	Strategy exists but has not been linked to business results	Some work has been dedicated managing the knowledge. Recognize motto "Sharing knowledge is power"	The network is managed consistent with business requirements.	Learning before, during and after the work is the way that have been entrenched in the organization	Knowledge available just-in-time- and easily accessible
(Consistently apply)	A clear framework and set of tools for learning have been widely communicated and understood		The network has a clear frame of reference		Learning before, during and after the work is the way that have been entrenched in the organization
			Systems and technologies available		

			and have been used well.		
Level 3	There is no framework or strategy clearly stated	Some leaders just talking about it, but did not realize it into action	Employees facilitated in the form of a network to get results	Employees can easily find out what the organization knows. Sharing a	Seeking knowledge before doing the work are encouraged and cultivated
(Act)	The PE are already accustomed to using a number of tools to assist the process of learning and sharing examples of SOP, etc		Network are created	good example and use a good example has been introduced and well done applied	Although there is little or no screening process and precipitation in the form of understanding
Level 2	Most employees have recognized that	Some managers give little time for sharing and learning, but there is support from superiors though it looks only slightly	Existing ad-hoc network that works to help the individual to know each other	Employees learn before work and schedule a session to reviewing the results of their work	Team catch the learning outcomes after the project
(React)	knowledge sharing is important for the success of the organization				Access to knowledge, though not summarized
Level 1	Fewer employees stating that knowledge know-how essential to the organization	Leaders still think that networking will lead to a lack of accountability	Networking are acknowledged	Employees are aware of the need to learn from what they do, but rarely get the time	They rarely refresh knowledge, contribute little, and very few do a search for knowledge
(Awareness)		Still doubt that "Knowledge is power"		Sharing just for the sake of the team	

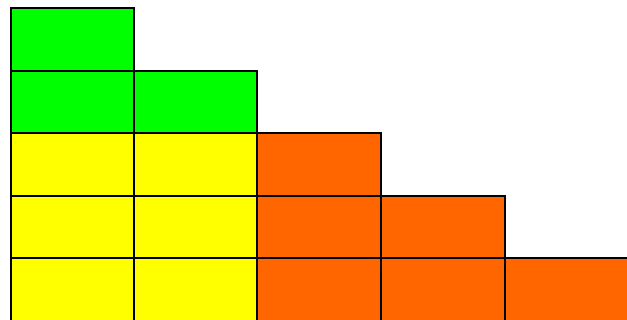


Figure 3.3 Gap Actual and Target of River Model

Finally the constructed model is shown in above figure as the figure reflecting the Gap between the Target and Actual. Parameter of KM model shown in the orange color is the parameter that having the biggest gap between actual and target.

3.3.4 QFD

Quality Function Deployment (QFD) is application use to develop the service in industry or to make improvement of service quality by involving the users/ customer. Tool that used in the QFD is House of Quality, to know what attributes that affected the level of service performed by Purchasing Department.

After the data are tested, and if the result of data statistically are valid and reliable then the data are input to the River model referring to the following attribute in table 3.4.

Table 3.4 Attribute SERVQUAL

Variable	Attribute	
	Expectation	Perspective
Tangible	<ul style="list-style-type: none"> • Modern Procurement System e.g. Intranet Information System, SAP, ARIBA • Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day 	<ul style="list-style-type: none"> • Modern Procurement System e.g. Intranet Information System, SAP, ARIBA • Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day
Reliability	<ul style="list-style-type: none"> • Fastest procurement lead time • Competitive price of goods/services and good negotiation skills 	<ul style="list-style-type: none"> • Fastest procurement lead time • Competitive price of goods/services and good negotiation skills
Responsiveness	<ul style="list-style-type: none"> • Proactive monitoring and Follow up orders • Prompt solving problems of tender / during contract run-on 	<ul style="list-style-type: none"> • Proactive monitoring and Follow up orders • Prompt solving problems of tender / during contract run-on
Competence	<ul style="list-style-type: none"> • Technical competencies of C&P staff to create PO/Contract • On time delivery of orders 	<ul style="list-style-type: none"> • Technical competencies of C&P staff to create PO/Contract • On time delivery of orders
Courtesy	<ul style="list-style-type: none"> • Willingness of C&P staff to listen to user's complain and solve the problem • Capability of C&P staff to positively respond when corresponding to users 	<ul style="list-style-type: none"> • Willingness of C&P staff to listen to user's complain and solve the problem • Capability of C&P staff to positively respond when corresponding to users

Factor analysis is needed to construct QFD model. In principle, factor analysis are seek to simplify complex relationships and the result can be varies between set of variables study that observed, with the reveal dimensions that connected to these variables. The data use as reference for identifying these factors is the expectations and perception for service quality of Purchasing

Department by its user. To seek for the variables that exist in what factors, in other words is to search the factors that can reflect quality of the service.

Steps in the analysis of these factors are:

1. Develop a matrix of raw data

Raw data matrix obtained from original data of the questionnaires. This matrix size in $p \times q$, where p indicates the number of respondents who filled out questionnaires and q indicates the number of manifest variables, in this case represented by the number of items in the questionnaire.

2. Calculation of Service Quality

At this stage, Service Quality is calculated from the value of SERVQUAL. Calculation is made base on the differences between perceptions and expectations of user to the Service Quality of Purchasing Department. In applying the method SERVQUAL required weighting factors.

3. Determining Weightening Factor

Weighting factor are generated from Interview of experienced employees in the company, with the minimal level of Head of Section and minimum 9 service years as purchasing actors.

4. Calculation value of SERVQUAL

The measures used to calculate the value of SERVQUAL are as follows:

- 1) Determine the SERVQUAL value (S_i) for each statements of the respondent / user, using the equation:

$$S_i = P_i - E_i \quad ,i = 1,2,3,\dots,n$$

Where:

P_i : Perception value of the respondent / user for the statement -i

E_i : Expectation value of the respondent / user for the statement -i

- 2) Sum the servqual value that obtained in each criteria for each respondent / user, and divide by the number of statements that represent these criteria to the equation :

$$SK_i = \frac{\sum_{i=1}^n S_i}{n} \quad ,i = 1,2,3,\dots,n$$

Where SK_i is the mean of SERVQUAL for the criteria

- 3) Multiply the value of SK_i with weights (w_i) allocated to those criteria, therefore obtained the value of weighted servqual (SQ_i) for that criteria for each respondent / user, by the equation:

$$\bullet \quad SQ_i = \sum_{i=1}^n SK_i * w_i \quad ,i = 1,2,3,\dots,n$$

- 4) Add up the value of SQ_i to get total servqual value (TSQ) for each respondent / user. The equation is:

$$TSQ = \sum_{i=1}^n SQ_i \quad ,i = 1,2,3,\dots,n$$

- 5) If there are N respondents / user, then the TSQ with N to obtain the average of total servqual value. The equation is:

$$TSQ = \frac{TSQ}{N} \quad ,i = 1,2,3,\dots,n$$

3.3.5 Construction of House of Quality (HoQ)

QFD process includes the making of one or more number of matrix. The first matrix called the House of Quality (HOQ), and the research is limited to the first matrix. HOQ featuring the voice of user or desire and user needs, as well as technical response that created by the design team to meet the users' desire and requirement

Outline in making House of Quality (HOQ):

Outputs of the House of Quality are:

- The relationship between user needs and technical response

- Target of the technical response of the product that are going to be developed

Input for the matrix of product planning (HoQ) as of:

- User's needs and degree of importance
- Technical response as translated result of the of user's need

General Steps in making HoQ

- Making the list of quality element that wanted by the users in the left diagram, also using parameter resulted in the River model then combine with SERVQUAL into HOQ.
- Making the list of technical quality response as the part of the quality that needed.
- Determine the relationship between quality that wanted by the customer with the response of technical quality. In here can be done calculation of the performance as per quality that wanted by the customer.

Generally part of the HoQ is as following:

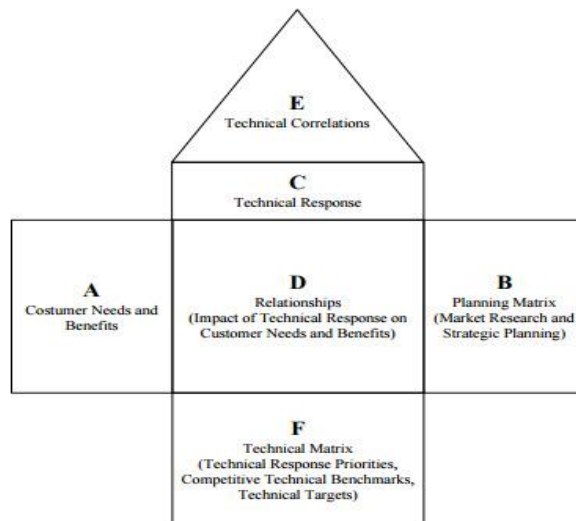


Figure 3.4. HoQ general model

a) Part A: Customer Needs and Benefits.

The first part of the HOQ is user needs and benefits, or often referred to as the voice of consumers (Users need). This section are filled by the result of the survey of the expectation and perception, or called Matrix What's.

b) Part B: Planning Matrix

The second part of the HOQ is planning matrix. This section is where targeting / product of interest, based on the interpretation from the questionnaires.

c) Section C: Technical Response.

The third part of the HOQ is a technical response, often also called Substitute Quality Characteristic (SQC). This process will seek answers to the question how (how) the consumer needs can be met.

To determine technical response (*Matrix How's*) on how the management of Purchasing Department fulfilled the request of the users, acquired by *Focus Group Discussion* (FGD) with the expert and experienced person in Purchasing Department.

d) Section D: Relationship Matrix.

The fourth part of the HOQ is filling part of the matrix of relationships (relationships matrix). By placing the desires of consumers on the left and the response technical at the top of the HOQ, it can be systematically evaluated their relationship. In this step, is to identify the link between WHAT and HOW which interpreted into Strong, Moderate or Weak. Data acquired by *Focus Group Discussion* (FGD) with the expert and experienced person in Purchasing Department.

e) Section E: Technical Correlations.

The fifth part of HOQ is technical correlations matrix, which is located on top and resembles a roof. This matrix is used to assist in

determining the design team who experienced a bottleneck, and define the key communication among designers. In addition, this matrix also describes the relationships and dependencies among the technical response. Among elements response of such techniques, may influence each other, both positive (mutual support) or negative (conflicting).

f) Section F: Technical Matrix.

The sixth of the HOQ is technical matrix. This section contains three types of data:

1. Technical Response Priorities.
2. Technical Competitive Benchmarks.
3. Target Technical

3.3.6 TRIZ

TRIZ is a method to search for a solution of the problem that appeared. It works from problem, afterward looking for the solution to that problem. Normally when there is a solution for a problem, may have an effect to other problem, where TRIZ solution is to seek solution from the problem and as well reducing the effect of new problem from that solution.

Based on the literature of TRIZ, and focusing on improving service quality, then come to the line of the general problem solving stages, as of following:

1. Stage 1 Describe scope of the problem. For example, depending on the type services provided by Purchasing Department. This study is observed by fulfilling the requirement from user, which can be done thru sharing knowledge in Supply Chain Events.
2. Stage 2 Determine the affect of service quality and consumers satisfaction which can be seen from various perspectives to the sectors that defined it. If focused on improving quality, the reference material related to that sector should be extensively analyzed in order to find dominant characteristic that affected the service quality in this sector. To know

needs and desires of the most important parameter according to user, use the QFD.

3. Stage 3 Application of TRIZ contradiction matrix to solve problems step-by-step.
 - a. Phase 3.1 Describe the problem with all the necessities and desires of consumers.
 - b. Phase 3.2 Define the ideal situation to be achieved without the use extra resources to solve the contradiction problem
 - c. Phase 3.3 Determine the most important Phase, selected from the rankings, to identify conflicts, that are going to be enhance.
 - d. Phase 3.4 According to TRIZ contradiction matrix, the numbers of TRIZ inventive principles can be collected from the intersection excess and shortage of TRIZ parameters.
 - e. Phase 3.5 Marking the 39 TRIZ inventive principles based the contents of the problem.
 - f. Phase 3.6 Adhering the principle marked and propose ways, all possible solutions.
 - g. Phase 3.7 Testing to obtain solution that enables criteria such as cost, time, human resources availability, the level of technology, etc.
4. Stage 4 Based on the results of data processing, found the solution to improve quality of services that proposed by Purchasing Department

In this research, to do the list steps for processing problem solving using TRIZ as of following:

- a) Priority for Improvement

The beginning stage for the solution using TRIZ method derived from the QFD analysis. From the result of QFD, is use to make the priority of problems that needs to be solved, beginning the high priority problem to the low priority problem. Afterwards from each problem that occurred,

make the first solution which is conclusion of the proposal from user of Purchasing Department.

b) First Improvement and Effect of the Improvement

Modeling the problem using the function diagram that aims to analyze the cause and effect arise from the early solution. Afterwards, solution from that effect translated to the technical parameter (39 TRIZ parameters) developed by *Altshuller*. The technical parameters are divided into two, namely improving features and Worsening feature. Improving feature is to be achieved for quality improvement. Worsening feature is things to be reduce side effect of improving feature.

c) Contradiction based on TRIZ Inventive Principles

At this stage, improving and worsening feature incorporated in the matrix of contradictions is to seek for inventive Principles. Once inserted into the matrix of contradictions, there will be some inventive principles at the junction between improving feature and worsening feature. Inventive which will be used in preparation of solutions is occurring at least twice (*Ton Su, et.al., 2008*).

d) Application of Inventive Principles

Each application of the inventive principles are analyzed and adapted to the conditions that exist in the Purchasing Department. Technical proposals tailored to the requirements and technical measurement.

e) Solution Proposal

After some proposal for problem solving are found, that related to the services from Purchasing Department to its user, then priority proposal are made into the application. According to *Ton Su, et.al., (2008)*, these priorities must meet the criteria in making the final decision, namely: cost, time, and human resources. Furthermore, it should consider Technical Difficulty of each proposed solutions.

3.4. Stage 3: Analysis and Conclusion

1. Analysis

The analysis is conducted in service quality between expectation and reality. The priority is service required by the user and also analyzes the possible solution for improvement as well as maintaining the service using River Model, QFD and TRIZ. Evaluation of service quality is also carried out to obtain not only optimum results to improve user satisfaction, but also mitigation action to maintain the quality of service from purchasing department. Once the evaluation of service quality is carried out, the implementation of this service quality improvement shall be determined and follow up using available resources in the purchasing department.

2. Conclusion and Recommendation

The final stage in this research is the conclusion and recommendation/suggestions for further research. Based on the results of the analysis stage it will then conclude whether the research is able to answer the questions posed. In addition to the conclusion there are also suggestions for the development of future researches. Some disadvantages list during research investigation will be determined into appropriate advices to measure the weakness during this research can be reduced and bring into optimal use of the science.

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CHAPTER 4

ANALYSIS AND DISCUSSION

Data processing and analysis in this chapter is done thru survey and follows the structure in previous chapter. The distribution and collection of the questionnaire are held from 8th December 2016 - 12th January 2017. Variable of QFD and River Model are made based on the experience and senior management level in the company of PT.A and then results of data are tested statistically and process using QFD and River Model.

The Expectation is the desire for Service Quality from Purchasing Department, while the Perception is the actual state of Service Quality from Purchasing Department. Those variables are measured as of following:

- a. Expectation and Perception of Tangible
- b. Expectation and Perception of Reliability
- c. Expectation and Perception of Responsiveness
- d. Expectation and Perception of Competence
- e. Expectation and Perception of Empathy

For River Model the target measurement is the target that is set for the variable, whilst the actual is the reality of the actual service that received.

- a. Actual and Target of KM strategy
- b. Actual and Target of Leadership
- c. Actual and Target of Networking
- d. Actual and Target of Learning before during and after
- e. Actual and Target of Capturing

The score of question and answer in SERVQUAL use 5 level of scoring (Likert Scale), from Very Important to Not Important.

Score on the answer of Expectation:

- a. Very Important = Score 5
- b. Important = Score 4
- c. Moderate = Score 3
- d. Less Important = Score 2
- e. Not Important = Score 1

Score on the answer of Perception:

- a. Very Important = Score 5
- b. Important = Score 4
- c. Moderate = Score 3
- d. Less Important = Score 2
- e. Not Important = Score 1

The score of question and answer in River Model using 5 scale of measurement from the Level Way We Work to Awareness Level.

Score on the answer of Expectation:

Score on the answer of Target:

- a. Level Way we Work = Score 5
- b. Consistently Apply = Score 4
- c. Action = Score 3
- d. React = Score 2
- e. Awareness = Score 1

Score on the answer of Actual:

- a. Level Way we Work = Score 5
- b. Consistently Apply = Score 4
- c. Action = Score 3
- d. React = Score 2
- e. Awareness = Score 1

4.1 Validity and Reliability test

Validity test used to identify if the questions already valid to describe the variables. The list of the questions generally supported to some group of variables. The higher validity score in measuring instrument, meaning it is getting right on target and continued showing what it intends to measure. Validity coefficient is measured from the *Person Product Moment (r) correlation*. Value of $r_{\text{measurement}}$ compared with the r_{table} product moment in the significant level of 0.05. If $r_{\text{measurement}}$ are bigger than r_{table} 0.05, meaning the question is valid. From the r table, with 9 respondents, therefore the *degree of freedom (df) = 9-2=7*, meaning the significant level 0.05 therefore r_{table} is 0.754

Table 4.1 Pearson Product Moment (r)

N	Signif. Level		N	Signif. Level		N	Signif. Level	
	0.05	0.01		0.05	0.01		0.05	0.01
3	0.997	0.999	11	0.602	0.735	19	0.456	0.575
4	0.950	0.990	12	0.576	0.708	20	0.444	0.561
5	0.878	0.959	13	0.553	0.684	21	0.433	0.549
6	0.811	0.917	14	0.532	0.661	22	0.423	0.537
7	0.754	0.874	15	0.514	0.641	23	0.413	0.526
8	0.707	0.834	16	0.497	0.623	24	0.404	0.515
9	0.666	0.798	17	0.482	0.606	25	0.396	0.505
10	0.632	0.765	18	0.468	0.590			

Reliability test is to measure the stability and consistency of the respondent answering the questions. The reliability of the measurement instrument indicates if the results are reliable; reliability test can be done to the entire question. In this research, *Alpha Cronbach* method used for reliability test, if the Alpha value > 0.7 , then the data is reliable.

Table 4.2 Validity and Reliability test of Expectation

SERVQUAL Expectation	Attribute	Description	Pearson Correlation r_{table}=0.754	Alpha Cronbach
Tangible	QE1	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	0.800	0.774
Tangible	QE2	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	0.800	0.774
Reliability	QE3	Fastest procurement lead time	0.920	0.771
Reliability	QE4	Competitive price of goods/services and good negotiation skills	0.960	0.768
Responsiveness	QE5	Proactive monitoring and Follow up orders	0.920	0.771
Responsiveness	QE6	Prompt solving problems of tender / during contract run-on	0.920	0.771
Competence	QE7	Technical competencies of C&P staff to create PO/Contract	0.960	0.768
Competence	QE8	On time delivery of orders	0.920	0.771
Courtesy	QE9	Willingness of C&P staff to listen to user's complain and solve the problem	0.960	0.768
Courtesy	QE10	Capability of C&P staff to positively respond when corresponding to users	0.960	0.768

Calculation of each variable item, are performed by using software *SPSS*. The result of Validity test as per above table, shown that *Pearson Product Moment (r)* for all the questions have the $r_{\text{measurement}}$ bigger then r_{table} , meaning all the questions is deemed valid for further process. It also showing that all correlation coefficients obtained from the user's expectations have high correlation, refer to criteria *Guilford* (1956), stated that correlation is considered high at a value ranging from 0.70 - <0.90.

In this study, the Reliability test is done by using *Alpha Cronbach*. Based on criteria established by the *American Psychological Association* (1985) and by *Kaplan and Saccuzzo* (1993), the minimum coefficient of reliability is 0.7. The study shows the result of *Alpha Cronbach* had the value above 0.7 therefore the Questionnaire is deemed to be reliable for further process.

Table 4.3 Validity and Reliability test of Perception

SERVQUAL Perception	Attribute	Description	Pearson Correlation rtable=0.754	Alpha Cronbach
Tangible	QP1	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	0.755	0.761
Tangible	QP2	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	0.770	0.761
Reliability	QP3	Fastest procurement lead time	0.840	0.753
Reliability	QP4	Competitive price of goods/services and good negotiation skills	0.880	0.766
Responsiveness	QP5	Proactive monitoring and Follow up orders	0.880	0.771
Responsiveness	QP6	Prompt solving problems of tender / during contract run-on	0.980	0.759
Competence	QP7	Technical competencies of C&P staff to create PO/Contract	0.980	0.759
Competence	QP8	On time delivery of orders	0.790	0.766
Courtesy	QP9	Willingness of C&P staff to listen to user's complain and solve the problem	0.790	0.766
Courtesy	QP10	Capability of C&P staff to positively respond when corresponding to users	0.790	0.766

This study gives the following results of *Alpha Cronbach* having the value of above 0.7; therefore the Questionnaire is deemed to be reliable for further process.

Table 4.4 Validity and Reliability test of Target

River Target	Attribute	Description	Pearson Correlation $r_{table}=0.754$	Alpha Cronbach
KM Strategy	RT1	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	0.968	0.768
KM Strategy	RT2	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	0.968	0.768
Leadership	RT3	Fastest procurement lead time	0.968	0.768
Leadership	RT4	Competitive price of goods/services and good negotiation skills	0.946	0.770
Networking	RT5	Proactive monitoring and Follow up orders	0.946	0.770
Networking	RT6	Prompt solving problems of tender / during contract run-on	0.893	0.773
Learning	RT7	Technical competencies of C&P staff to create PO/Contract	0.891	0.772
Learning	RT8	On time delivery of orders	0.891	0.772
Capturing	RT9	Willingness of C&P staff to listen to user's complain and solve the problem	0.893	0.773
Capturing	RT10	Capability of C&P staff to positively respond when corresponding to users	0.868	0.777

Calculation of each variable item are performed by using software SPSS. From the Validity test, resulted as per the above table, it can be seen that the *Pearson Product Moment* (r) correlation for all the question, have the $r_{measurement}$ bigger then r_{table} , meaning the entire question is deemed to be valid for further process. From the above table, it shown that all correlation coefficients obtained for the user's expectations have high correlation, refer to criteria *Guilford* (1956), stated that correlation is considered high at a value ranging from 0.70 - <0.90.

The Reliability test is done by using *Alpha Cronbach*. Based on criteria established by the *American Psychological Association* (1985) and by *Kaplan and Saccuzzo* (1993), the minimum coefficient of reliability that must be fulfilled by a measuring instrument is 0.7. This study gives the following results of *Alpha Cronbach* having the value above 0.7 therefore the Questionnaire is deemed to be reliable for further process.

Table 4.5 Validity and Reliability test of Actual

River Actual	Attribute	Description	Pearson Correlation rtabel=0.754	Alpha Cronbach
KM Strategy	RA1	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	0.926	0.767
KM Strategy	RA2	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	0.795	0.781
Leadership	RA3	Fastest procurement lead time	0.930	0.775
Leadership	RA4	Competitive price of goods/services and good negotiation skills	0.900	0.774
Networking	RA5	Proactive monitoring and Follow up orders	0.962	0.768
Networking	RA6	Prompt solving problems of tender / during contract run-on	0.939	0.771
Learning	RA7	Technical competencies of C&P staff to create PO/Contract	0.949	0.769
Learning	RA8	On time delivery of orders	0.991	0.770
Capturing	RA9	Willingness of C&P staff to listen to user's complain and solve the problem	0.940	0.766
Capturing	RA10	Capability of C&P staff to positively respond when corresponding to users	0.926	0.767

This study gives the following results of *Alpha Cronbach* having the value above 0.70 therefore the questionnaire is deemed to be reliable for further process.

4.2 ServQual Analysis

The recapitulation of the answer from user's respondent is shown in below table:

Table 4.6 Distribution of answer from the Expectation

SERVQUAL Perception	Attribute	Description	VI (5)	I (4)	M (3)	LI (2)	NI (1)
Tangible	QE1	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	2	5	1	1	0
			22%	56%	11%	11%	0%
Tangible	QE2	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	2	5	1	1	0
			22%	56%	11%	11%	0%
Reliability	QE3	Fastest procurement lead time	3	4	1	1	0
			33%	44%	11%	11%	0%
Reliability	QE4	Competitive price of goods/services and good negotiation skills	2	6	1	0	0
			22%	67%	11%	0%	0%
Responsiveness	QE5	Proactive monitoring and Follow up orders	3	6	0	0	0
			33%	67%	0%	0%	0%
Responsiveness	QE6	Prompt solving problems of tender / during contract run-on	3	5	1	0	0
			33%	56%	11%	0%	0%
Competence	QE7	Technical competencies of C&P staff to create PO/Contract	3	5	1	0	0
			33%	56%	11%	0%	0%
Competence	QE8	On time delivery of orders	4	4	1	0	0
			44%	44%	11%	0%	0%
Courtesy	QE9	Willingness of C&P staff to listen to user's complain and solve the problem	4	4	1	0	0
			44%	44%	11%	0%	0%
Courtesy	QE10	Capability of C&P staff to positively respond when corresponding to users	4	4	1	0	0
			44%	44%	11%	0%	0%

Table 4.7 Questionnaires result of Expectation and Perception

Variable	Description	Total Expectation	Total Perception	Mean Expectation	Mean Perception	Servqual Score	% Suitability
Tangible	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	40	35	4.44	3.89	0.56	88%
Tangible	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	40	35	4.44	3.89	0.56	88%
Reliability	Fastest procurement lead time	42	36	4.67	4.00	0.67	86%
Reliability	Competitive price of goods/services and good negotiation skills	41	37	4.56	4.11	0.44	90%
Responsiveness	Proactive monitoring and Follow up orders	42	39	4.67	4.33	0.33	93%
Responsiveness	Prompt solving problems of tender / during contract run-on	42	38	4.67	4.22	0.44	90%
Competence	Technical competencies of C&P staff to create PO/Contract	41	38	4.56	4.22	0.33	93%
Competence	On time delivery of orders	42	39	4.67	4.33	0.33	93%
Courtesy	Willingness of C&P staff to listen to user's complain and solve the problem	41	39	4.56	4.33	0.22	95%
Courtesy	Capability of C&P staff to positively respond when corresponding to users	41	39	4.56	4.33	0.22	95%

The analyses in this study are limited to Gap 5, which is the gap between the expectations from users with the services received by user, due to non-fulfillment of user expectations. Gap 5 dimensional calculation' result shown that all the attributes is not 100% suitable, meaning the users is not satisfied with the quality of service from Purchasing Department.

4.3 River Model

River Model used to know further process, on which elements of each attribute having the greatest gap between Target and Actual. The process of the river model is using the input data from the questionnaire. First the data are tested, if it statistically proven valid and reliable, and then the data are eligible for further process referring to the following attribute in below table

Table 4.8 Distribution answer of the Target

RIVER Target	Attribute	Description	LWWW (5)	CA (4)	A (3)	R (2)	A (1)
KM Strategy	RT1	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	5	3	1	0	0
			56%	33%	11%	0%	0%
KM Strategy	RT2	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	5	3	1	0	0
			56%	33%	11%	0%	0%
Leadership	RT3	Fastest procurement lead time	5	3	1	0	0
			56%	33%	11%	0%	0%
Leadership	RT4	Competitive price of goods/services and good negotiation skills	4	4	1	0	0
			44%	44%	11%	0%	0%
Networking	RT5	Proactive monitoring and Follow up orders	4	4	1	0	0
			44%	44%	11%	0%	0%
Networking	RT6	Prompt solving problems of tender / during contract run-on	3	5	1	0	0

			33%	56%	11%	0%	0%
Learning	RT7	Technical competencies of C&P staff to create PO/Contract	4	4	1	0	0
			44%	44%	11%	0%	0%
Learning	RT8	On time delivery of orders	4	4	1	0	0
			44%	44%	11%	0%	0%
Capturing	RT9	Willingness of C&P staff to listen to user's complain and solve the problem	3	5	1	0	0
			33%	56%	11%	0%	0%
Capturing	RT10	Capability of C&P staff to positively respond when corresponding to users	2	6	1	0	0
			22%	67%	11%	0%	0%

Table 4.9 Distribution answer of the Actual

RIVER Actual	Attribute	Description	LWWW (5)	CA (4)	A (3)	R (2)	A (1)
KM Strategy	RT1	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	2	4	1	1	1
			22%	44%	11%	11%	11%
KM Strategy	RT2	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	3	5	0	1	0
			33%	56%	0%	11%	0%
Leadership	RT3	Fastest procurement lead time	3	4	1	1	0
			33%	44%	11%	11%	0%
Leadership	RT4	Competitive price of goods/services and good negotiation skills	3	3	2	1	0
			33%	33%	22%	11%	0%
Networking	RT5	Proactive monitoring and Follow up orders	3	4	0	2	0
			33%	44%	0%	22%	0%
Networking	RT6	Prompt solving problems of tender / during contract run-on	2	3	2	2	0
			22%	33%	22%	22%	0%

Learning	RT7	Technical competencies of C&P staff to create PO/Contract	3	3	1	2	0
			33%	33%	11%	22%	0%
Learning	RT8	On time delivery of orders	2	5	0	2	0
			22%	56%	0%	22%	0%
Capturing	RT9	Willingness of C&P staff to listen to user's complain and solve the problem	2	3	2	1	1
			22%	33%	22%	11%	11%
Capturing	RT10	Capability of C&P staff to positively respond when corresponding to users	2	4	1	1	1
			22%	44%	11%	11%	11%

Table 4.10 Questionnaire result of the Target and Actual

Respondent	1		2		3		4		5		6		7		8		9	
	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T
KM Strategy	4	4	5	5	2.5	5	4	5	2	3	4	5	5	5	4	4	4	4
Leadership	4	4	5	5	3	4.5	5	5	2	3	3.5	5	5	5	4	4	4	4
Networking	4	4	5	5	2	4	4	5	2	3	3.5	4.5	5	5	4	4	4	4
Learning	4	4	5	5	2	5	4.5	4.5	2	3	3.5	4.5	5	5	4	4	4	4
Capturing	4	4	5	5	1	4	3	4	2	3	4	4.5	5	5	4	4	4	4

The gap calculation between the Actual and Target of user, obtained from the average value of each variable and the gap is viewed as river. Gap in question is the value of the average consumer's Target, minus average value of Actual, the less the gap, meaning the actual service are closer to the target.

Table 4.11 Questionnaire result of the River Model

Gap	1		2		3		4		5		6		7		8		9	
	Level	Gap	Level	Gap	Level	Gap	Level	Gap	Level	Gap	Level	Gap	Level	Gap	Level	Gap	Level	Gap
KM Strategy	4	0	5	0	2.5	2.5	4	1	2	1	4	1	5	0	4	0	4	0
Leadership	4	0	5	0	3	1.5	5	0	2	1	3.5	1.5	5	0	4	0	4	0
Networking	4	0	5	0	2	2	4	1	2	1	3.5	1	5	0	4	0	4	0
Learning	4	0	5	0	2	3	4.5	0	2	1	3.5	1	5	0	4	0	4	0
Capturing	4	0	5	0	1	3	3	1	2	1	4	0.5	5	0	4	0	4	0

The results of the survey are divided into below variable:

- KM Strategy
- Leadership behavior
- Networking
- Learning Before, During and After
- Capturing knowledge

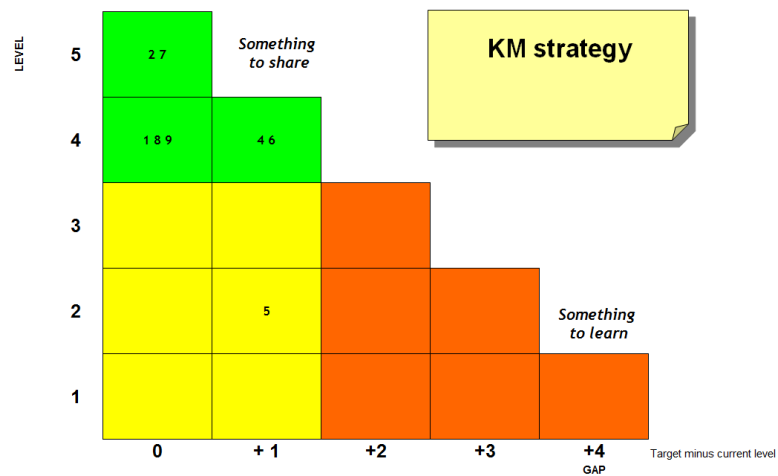


Figure 4.1 River Model KM Strategy of Purchasing Department

In this KM strategy informed that not all the respondent having the same target and actual, but some of it already reach level 5 (Way we work) and level 4 (Consistently apply). Most of respondent experienced the actual in level 4, this means that strategy exists but has not been linked to business results.

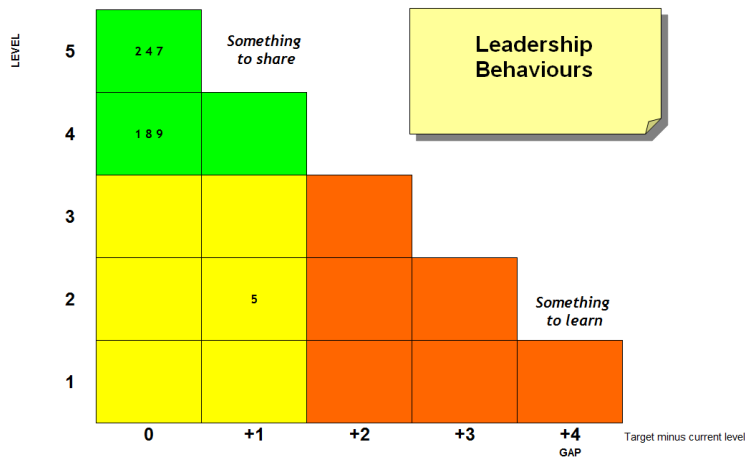


Figure 4.2 River Model Leadership of Purchasing Department

In this Leadership behaviors informed the gap from the respondents, meaning the target and actual have difference, and informed most of the gap are level 4 (Consistently apply). Meaning that the leader has been promoting ways of behaving and acting as a true role model and some work has been dedicated managing the knowledge, recognizing motto "Sharing knowledge is power".

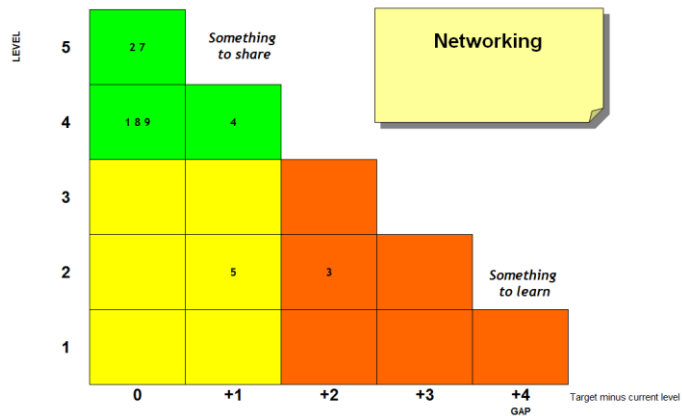


Figure 4.3 River Model Networking of Purchasing Department

In this Networking it is informed that there is even the gap is +2, meaning the target and actual have relative difference, but the gap also +1, most the respondents feels that their target and actual have somewhat difference. This means that Networking is acknowledged and existing ad-hoc network works to help the individual to know each other.

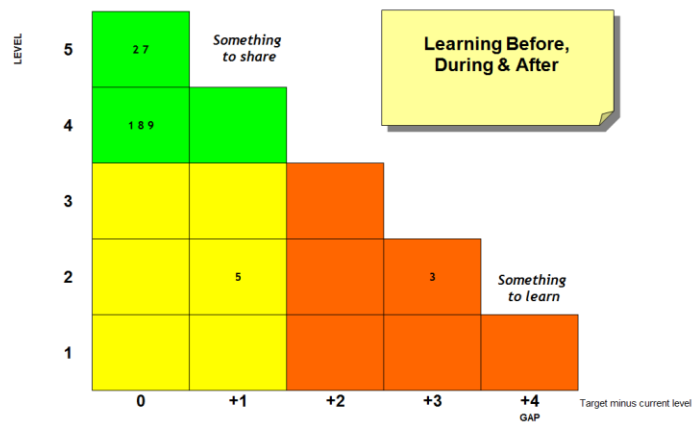


Figure 4.4 River Model Learning of Purchasing Department

In this Learning before, during and after informed the gap is +3, meaning the target and actual have big difference. Meaning Employees can easily find out what the organization knows and sharing a good example and use a good example has been introduced and well done applied.

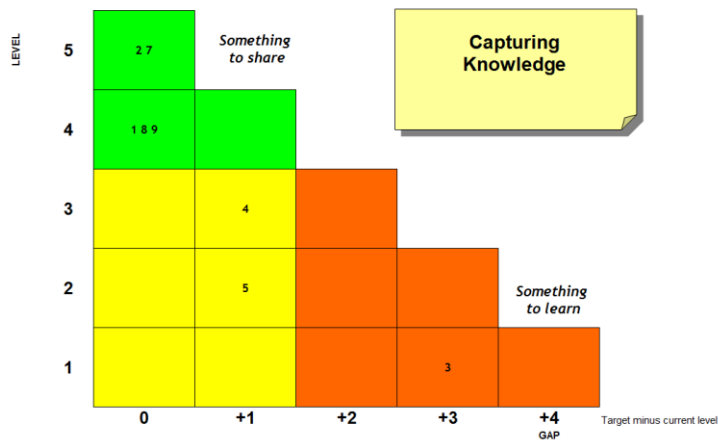


Figure 4.5 River Model Capturing of Purchasing Department

In this Capturing Knowledge it is informed negative gap is +3, the target and actual have some difference. This gap meaning seeking knowledge before doing the work are encouraged and cultivated and also little or no screening process and precipitation in the form of understanding.

Seeing from the above river model, it shown most of the variable is still having gap, most of the user are agreed but not satisfy with the service quality of Purchasing Department.

4.4 Quality Function Deployment (QFD)

Design stages House of Quality are made in order to improve the quality of service. To determine the standard performance of the technical response and priority improvement of the attribute, are done using the Quality Function Deployment (QFD). QFD is a structured method that can be used in determining the technical response of the standard performance of Purchasing Department.

Steps that are taken to make QFD (House of Quality) matrix as follows:

1. Identify the Voice of the Customer
2. Determine the level of importance of service attributes
3. Develop the technical response of service
4. Determining the relationship between voice of customer and technical response
5. Determine the relationship of technical response
6. House of Quality

Normally inputs for Voice of Customer using the Servqual, with variable of Tangible, Reliability, Responsiveness, Competence, and Courtesy. However in this QFD are combining with River Model, with consideration and based on experience from the senior employees of PT.A and also advisor lecturer, it is said the combination of variable of the Servqual and River model are representative to find the priorities of the problem that occurred in PT.A.

4.4.1 Identify the Voice of the Customer

Development of House of Quality (HoQ) as part of Voice of Customer is identified by each variable in the Servqual and River Model, as shown in the below table:

Table 4.12 Variable Voice of Customer

SERVQUAL			River Model		
Tangible	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	V1	KM Strategy	The procurement process already included in the business framework and already has tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing.	V11
Tangible	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	V2	KM Strategy	Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up and socialize in the Contract and Procurement Events	V12
Reliability	Fastest procurement lead time	V3	Leadership	Action and responsibility are well define among actors, and each actors are aware their role in the procurement	V13
Reliability	Competitive price of goods/services and good negotiation skills	V4	Leadership	Personnel capacity to organize, communicate well within internal organization	V14
Responsiveness	Proactive monitoring and Follow up orders	V5	Networking	There are tools to ease the communication or networking among procurement actors to promptly solving problem	V15
Responsiveness	Prompt solving problems of tender / during contract run-on	V6	Networking	Having the connection from other entities and actively seek to solve the problem	V16
Competence	Technical competencies of C&P staff to create PO/Contract	V7	Leadership	Actively discussed on the problem that exist, and actively seek an answer to the experienced person	V17
Competence	On time delivery of orders	V8	Leadership	Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc	V18
Courtesy	Willingness of C&P staff to listen to user's complain and solve the problem	V9	Capturing	Knowledge on Know-How on the operation in OG applied in the procurement process	V19
Courtesy	Capability of C&P staff to positively respond when corresponding to users	V10	Capturing	Knowledge are available just-in-time, user friendly and well applied	V20

4.4.2 Determine the level of importance of service attributes

Degree of importance from Voice of Customer, explained how importance the attributes, according to the user of Purchasing Department. Degree of importance of Voice of Customer taken from the means of expectations resulted from the survey, the importance of Voice of Customer expressed in the HoQ (House of Quality).

4.4.3 Develop the technical response of the service attributes

Technical response of the Purchasing Department service quality gathered from senior and experience people in PT.A, which having more than 10 service years in the company, particularly in the Purchasing Department.

Table 4.13 Technical Response Attributes

1	Additional PE (Purchasing Engineer)
2	Apply of Rule/Regulation Enforcement
3	Clear specification of PR (Purchase Requisition)
4	Conduct C&P staff competency assessment
5	Conduct regular coordination with authorities
6	Conduct regular DUET meeting
7	Conduct regular SRM (Supplier Relationship Management) meeting
8	Cross functionality with other entities
9	Define company standard SOW (Scope of Works)
10	Enhance Procurement Compliances
11	Enhance SMS (Supplier Management System) function
12	Enhance MI (Market Intelligence) for the procurement
13	Implementation of Consignment Contract
14	Implementation of PSP (Purchasing Service Provider)/ Shopping Chart
15	Integrate the datasheet or drawing or picture into material master
16	Issue procurement planning
17	Issue quality contractual document
18	Make OA (Outline Agreement) /MSA(Multi Standing Agreement) /PA (Price Agreement) Contract Strategy
19	Optimize auto assessment tools (IMPACTS 2, ASAP)
20	Optimize speed of approval process
21	Professional budget creation

22	Professional OE (Owner Estimate) creation
23	Regular coordination meeting with HQ
24	Regular training for Purchase Engineer
25	Regularly monitor delivery status
26	Regularly monitor PR (Purchase Requisition) on progress
27	Reliable support system
28	Review current SOP/WI and company regulation
29	Rotation of Purchase Engineers
30	Sharing Knowledge (Contact)
31	Socialization of related regulation
32	Speed up TE (Technical Evaluation) Process
33	Survey/Visit Field/Workshop/Supplier premises
34	Utilize and enhance REX+ (Return of Experience), Ensiklo
35	Review of Purchasing objective

4.4.4 Determine the relationship between voice of customer and technical response

To show the relationship of Technical Response, then given the scoring as:

- 9 Meaning have strong link
- 3 Meaning have moderate link
- 1 Meaning have weak link

4.4.5 Determine the relationship of technical response

Technical Response, expressed the relationship between technical response, which is every technical response compared with other technical response. This correlation used to see if one technical response influences to other technical response, as below

- + is synergy
- is compromise
- Blank is no connection

4.4.6.1 Analysis Importance of Customer

Degree of interest is variable that needed by the user of Purchasing Department. The result of processing attribute of needs connecting to the degree of interest resulting as below:

Table 4.14 Degree of Importance according to users

Voice of customer	Variable	Variable	Importance of Whats	Rank
Fastest procurement lead time	Reliability	V3	4.67	1
Proactive monitoring and Follow up orders	Responsiveness	V5	4.67	2
Prompt solving problems of tender / during contract run-on	Responsiveness	V6	4.67	3
On time delivery of orders	Competence	V8	4.67	4
Competitive price of goods/services and good negotiation skills	Reliability	V4	4.56	5
Technical competencies of C&P staff to create PO/Contract	Competence	V7	4.56	6
Willingness of C&P staff to listen to user's complain and solve the problem	Courtesy	V9	4.56	7
Capability of C&P staff to positively respond when corresponding to users	Courtesy	V10	4.56	8
Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	Tangible	V1	4.44	9
Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	Tangible	V2	4.44	10
The procurement processes already included in the business framework and already have tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing.	KM Strategy	V11	4.44	11

Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up and socialize in the Contract and Procurement Events	KM Strategy	V12	4.44	12
Action and responsibility are well define among actors, and each actors are aware their role in the procurement	Leadership	V13	4.44	13
Personnel capacity to organize, communicate well within internal organization	Leadership	V14	4.33	14
There are tools to ease the communication or networking among procurement actors to promptly solving problem	Networking	V15	4.33	15
Actively discussed on the problem that exist, and actively seek an answer to the experienced person	Learning	V17	4.33	16
Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc	Learning	V18	4.33	17
Having the connection from other entities and actively seek to solve the problem	Networking	V16	4.22	18
Knowledge on Know-How on the operation in OG applied in the procurement process	Capturing	V19	4.22	19
Knowledge are available just-in-time, user friendly and well applied	Capturing	V20	4.11	20

4.4.6.2 Analysis of Technical Correlation

Technical correlation used to describe the relationship between technical responses to other technical response. In this relationship can be seen whether the target fulfillment of the technical response will affect other technical response. The scoring system for technical correlation strength can be seen in the symbol's table, to determine the direction of improvement of technical response. There are some technical correlations that have positive or negative relationship. Positive relationship indicates the increase influence of technical response to other technical response; similarly for negative relationship indicates decrease influence of technical response to other technical response.

4.4.6.3 Analysis Voice of Customer with Technical Response

The relationship between Technical Response with Voice of Customer symbolized thru the number of 9, 3, and 1. Score 9 mean that there is strong relationship, score 3 mean medium relationships, and score 1 mean weak relationship

Determinations Voice of Customer with the Technical Response is done by evaluating:

- Completeness, checking is all the voice of customer already connected at least one of the technical response.
- Breadth of coverage, means the measurement of the design, make sure that already define technical response as much as the Voice of Customer
- Density of coverage, checking the cell already completed in each of the connection.

Analysis of relationship between the Technical Response with voices of user by how strong the relationship between the technical responses with the needs from user. Each of the Technical Response of Purchasing Department shall have at least one relationship with the needs attribute whether in the position of 1, 3 or 9. Total Technical Response in the Purchasing Department is 35 Technical Response, resulted from Focus Group Discussion with the senior and expert, including Senior Supply Chain Specialist and Management of PT.A.

4.4.6.4 Analysis of the Result House of Quality

From the Matrix *House of Quality* can be known which steps must be done by the management of Purchasing Department to fulfill the needs of the user as below (ranking):

1. Conduct regular DUET meeting (TC6; %-age of Importance 5.32%)
2. Review of purchasing objective (TC35; %-age of Importance 3.76%)
3. Clear specification of PR (TC3; %-age of Importance 3.75%)
4. Conduct C&P staff competency assessment (TC4; %-age of Importance 3.59%)

5. Socialization of related regulation (TC31; %-age of Importance 3.55%)
6. Sharing Knowledge (Contact) (TC30; %-age of Importance 3.40%)
7. Enhance Procurement Compliances (TC10; %-age of Importance 3.29%)
8. Survey/Visit Field/Workshop/Supplier premises (TC33; %-age of Importance 3.28%)
9. Issue procurement planning (TC16; %-age of Importance 3.28%)
10. Regular training for Purchase Engineer (TC24; %-age of Importance 3.24%)
11. Utilize and enhance REX+, Ensiklo (TC34; %-age of Importance 3.08%)
12. Cross functionality with other entities (TC8; %-age of Importance 2.92%)
13. Review current SOP/WI and company regulation (TC28; %-age of Importance 2.91%)
14. Professional OE creation (TC22; %-age of Importance 2.85%)
15. Define company standard SOW (TC9; %-age of Importance 2.85%)
16. Make OA/MSA/PA Contract Strategy (TC18; %-age of Importance 2.82%)
17. Conduct regular SRM meeting (TC7; %-age of Importance 2.82%)
18. Optimize auto assessment tools (IMPACTS 2, ASAP) (TC19; %-age of Importance 2.78%)
19. Reliable support system (TC627; %-age of Importance 2.68%)
20. Enhance SMS function (TC11; %-age of Importance 2.67%)
21. Professional budget creation (TC21; %-age of Importance 2.64%)
22. Additional PE (TC1; %-age of Importance 2.56%)
23. Issue quality contractual document (TC17; %-age of Importance 2.55%)
24. Apply of Rule/Regulation Enforcement (TC2; %-age of Importance 2.53%)
25. Rotation of Purchase engineers (TC29; %-age of Importance 2.52%)
26. Implementation of Consignment Contract (TC13; %-age of Importance 2.40%)
27. Regularly monitor delivery status (TC25; %-age of Importance 2.40%)
28. Regularly monitor PR on progress (TC26; %-age of Importance 2.40%)
29. Integrate the datasheet or drawing or picture into material master (TC15; %-age of Importance 2.39%)
30. Enhance MI for the procurement (TC12; %-age of Importance 2.37%)

- 31. Regular coordination meeting with HQ (TC23; %-age of Importance 2.36%)
- 32. Optimize speed of approval process (TC20; %-age of Importance 2.09%)
- 33. Speed up TE Process (TC32; %-age of Importance 2.09%)
- 34. Implementation of PSP/ Shopping Chart (TC14; %-age of Importance 1.94%)
- 35. Conduct regular coordination with authorities (TC5; %-age of Importance 1.91%)

4.5 TRIZ

The result from QFD are taken for further proceed, in order to have improvement solution using TRIZ method, using the most potential quality that need to be improved. The prioritization calculation resulted and derived from sum multiplication between the importance's of whats, with its correlation to the technical response. Calculations in this study elaborated from the model House of Quality as discussed earlier.

Taken the priority resulted from HoQ, further calculation are sorted based on Pareto's law and divided into three classifications, namely A, B, C. The reason using Pareto's law to define the criticality of quality is needed due to no standard from company that available for Contract and Procurement, despite of that, the ABC analysis are often used by company as best practice in making the priority of actions, for example the calculation for determining stock level in the material inventory in company PT.A.

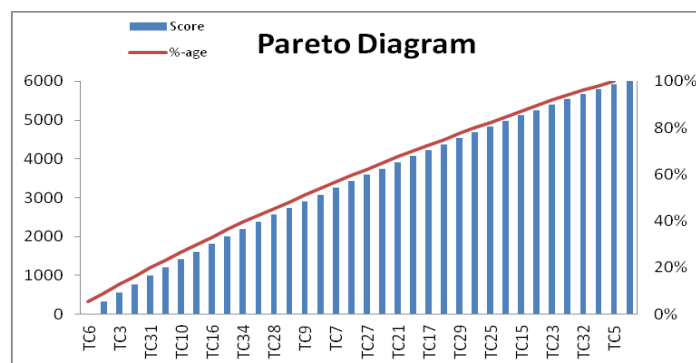


Figure 4.7 Pareto Diagram

Table 4.15 ABC classification based on HoQ result

Code	Technical	Rank	Score	Total Cum	% Cum	ABC	
TC6	Conduct regular DUET meeting	1	321	321	5%	A	
TC35	Review of Purchasing objective	2	227	548	9%		
TC3	Clear specification of PR	3	226	774	13%		
TC4	Conduct C&P staff competency assessment	4	217	990	16%		
TC31	Socialization of related regulation	5	214	1204	20%		
TC30	Sharing Knowledge (Contact)	6	205	1409	23%		
TC10	Enhance Procurement Compliances	7	198	1607	27%		
TC33	Survey/Visit Field/Workshop/Supplier premises	8	198	1806	30%		
TC16	Issue procurement planning	9	198	2003	33%		
TC24	Regular training for Purchase Engineer	10	196	2199	36%		
TC34	Utilize and enhance REX+, Ensiklo	11	186	2385	40%		B
TC8	Cross functionality with other entities	12	176	2561	42%		
TC28	Review current SOP/WI and company regulation	13	175	2736	45%		
TC22	Professional OE creation	14	172	2908	48%		
TC9	Define company standard SOW	15	172	3080	51%		
TC18	Make OA/MSA/PA Contract Strategy	16	170	3250	54%		
TC7	Conduct regular SRM meeting	17	170	3421	57%		
TC19	Optimize auto assessment tools (IMPACTS 2, ASAP)	18	167	3588	59%		
TC27	Reliable support system	19	161	3750	62%		
TC11	Enhance SMS function	20	161	3911	65%		
TC21	Professional budget creation	21	159	4070	67%		
TC1	Additional PE	22	154	4224	70%		
TC17	Issue quality contractual document	23	154	4378	73%		
TC2	Apply of Rule/Regulation Enforcement	24	153	4531	75%		
TC29	Rotation of Purchase engineers	25	152	4683	78%		
TC13	Implementation of Consignment Contract	26	145	4828	80%	C	
TC25	Regularly monitor delivery status	27	145	4972	82%		
TC26	Regularly monitor PR on progress	28	145	5117	85%		
TC15	Integrate the datasheet or drawing or picture into material master	29	144	5261	87%		
TC12	Enhance MI for the procurement	30	143	5405	90%		
TC23	Regular coordination meeting with HQ	31	142	5547	92%		
TC20	Optimize speed of approval process	32	126	5673	94%		
TC32	Speed up TE Process	33	126	5800	96%		
TC14	Implementation of PSP/ Shopping Chart	34	117	5916	98%		
TC5	Conduct regular coordination with authorities	35	115	6032	100%		

The priority of improvement using TRIZ method, are done for the A class of the Pareto, those parameters are:

- TC6 : Conduct regular DUET meeting
- TC35 : Review of Purchasing objective
- TC3 : Clear specification of PR
- TC4 : Conduct C&P staff competency assessment
- TC31 : Socialization of related regulation
- TC30 : Sharing Knowledge (Contact)
- TC10 : Enhance Procurement Compliances
- TC33 : Survey/Visit Field/Workshop/Supplier premises
- TC16 : Issue procurement planning
- TC24 : Regular training for Purchase Engineer
- TC34 : Utilize and enhance REX+, Ensiklo

Design Proposal of Quality Improvement using TRIZ method is done in each step as of follows:

4.5.1 Preliminary Improvement

Based on interviews with management of PT.A on the related solutions to realize between the technical requirements with the improvement needed, as shown in the below table:

Table 4.16 Improving Feature

	Technical	Improving
TC6	Conduct regular DUET meeting	Speed (9)
TC35	Review of Purchasing objective	Ease of operation (33)
TC3	Clear specification of PR	Speed (9)
TC4	Conduct C&P staff competency assessment	Productivity (39)
TC31	Socialization of related regulation	Loss of Information (24)
TC30	Sharing Knowledge (Contact)	Loss of Information (24)

TC10	Enhance Procurement Compliances	Reliability (27)
TC33	Survey/Visit Field/Workshop/Supplier premises	Adaptability or versatility (35)
TC16	Issue procurement planning	Loss of Time (25)
TC24	Regular training for Purchase Engineer	Adaptability or versatility (35)
TC34	Utilize and enhance REX+, Ensiklo	Loss of Information (24)

Preliminary solutions are as input in the technical table of requirement, and then adjusted with the table of contradiction matrix of Altshuller. In the contradiction matrix formed table of 39 x 39 elements that divided into two, which are 39 vertical elements as the improving feature and 39 horizontal elements as worsening feature. First stage to solve the problem using TRIZ is done thru search the improving feature. Improving features means preliminary solution for the improvement of service quality. From 11 attributes that are priority, adjusted with the table of improving features and had the 8 elements that corresponding with the technical requirement. The figure of attributes not having same meaning with the figure of element, due to each of the attribute is different. For example the socialization of related regulation have the same improvement feature with the Enhance REX+, Ensiklo, with the Improvement of Loss Information, though have different meaning, for the socialization of related regulation, meaning of the improvement of Loss Information is for the most recent regulation by the government (i.e. Surat edaran SKK) or by the Headquarters (i.e. new SOP), by having the socialization will reduce or eliminate the loss information. Whilst improvement feature for the Enhance REX+, meaning loss of information due to best practice to solve the problem that are done by other affiliates, may not having the same problem and or solution with affiliate in Indonesia.

4.5.2 Impact of the Improvement

Second step is the worsening feature, meaning the impact from first solution when the action is done. After the first stage in the contradiction matrix, which is determining the improving feature, the next step from technical

requirement are searched the worsening feature by considering improving feature in each attribute in the technical requirement, as the result is shown in below table:

Table 4.17 Worsening Feature

	Technical	Worsening
TC6	Conduct regular DUET meeting	Extent of automation (38)
TC35	Review of Purchasing objective	Loss of substance (23)
TC3	Clear specification of PR	Difficulty of detecting and measuring (37)
TC4	Conduct C&P staff competency assessment	Stress or pressure (11)
TC31	Socialization of related regulation	Ease of repair (34)
TC30	Sharing Knowledge (Contact)	Measurement accuracy (28)
TC10	Enhance Procurement Compliances	Loss of Time (25)
TC33	Survey/Visit Field/Workshop/Supplier premises	Loss of Time (25)
TC16	Issue procurement planning	Loss of Energy (22)
TC24	Regular training for Purchase Engineer	Force (10)
TC34	Utilize and enhance REX+, Ensiklo	Extent of automation (38)

The impact of improving features are in column of worsening feature, which having 9 elements (without repetition). Some of the element had different attributes, for the attribute that have the same elements in the improving features, cannot be determine as the same elements in the worsening features. For example attribute of Review Purchasing Objective have the improving features ease of operations, but the worsening features is loss of substances. Meaning if we are improving the review of purchasing objective, to be adaptable with the dynamics operations problems like reducing backlog, will have the worsening features of loss of substances of the contents Supply Chain particularly Purchasing Department.

4.5.3 Contradiction based on TRIZ Inventive Principles

Next step is to find the Inventive Principles based on the cross-junction of improving features with worsening features in the contradiction matrix. Those cross-junctions in each element will result number of inventive principles that have purpose, to seeks for the improving solution of the service quality.

Table 4.18 Inventive Principles

Improving	Worsening	Altshuller's Principles
Speed (9)	Extent of automation (38)	2,10,16,19,20,23
Ease of operation (33)	Loss of substance (23)	2,3,5,23,35
Speed (9)	Difficulty of detecting and measuring (37)	2,3,5,6,35
Productivity (39)	Stress or pressure (11)	2,5,9,10,19,20
Loss of Information (24)	Ease of repair (34)	2,6,19,23
Loss of Information (24)	Measurement accuracy (28)	3,6,19,23,26
Reliability (27)	Loss of Time (25)	5,13,19,20,24,36
Adaptability or versatility (35)	Loss of Time (25)	20,23,25,34
Loss of Time (25)	Loss of Energy (22)	19,20,23,24,26,35
Adaptability or versatility (35)	Force (10)	3,19,25,36
Loss of Information (24)	Extent of automation (38)	2,3,6,19,20,23,26

Preliminary solution from the 11 technical requirements attributes is to find the inventive principle that taken-off from the pair of improving feature with worsening feature. For pair of improving feature and worsening feature which have the same elements will be take out 1 time, therefore the sum of the attribute of technical requirement are not the same with the pair of improving features which is totally 16. Numbers of the inventive principle which taken from the pair of improving feature and worsening feature are used in the design of solution. This is based on the method from *Ton Su, et al (2007)*.

4.5.4 Proposal of Improvement using TRIZ based on Inventive Principles

The improvement of service quality, needs the solution that not only trial and error, but also shall consider the impact when those solutions are applied. This stage is the final stage to find the consideration of preliminary solution to improve the 11 attributes of Technical priority; the consideration is using the solution as proposed by the TRIZ method.

4.5.4.1 Conduct regular DUET meeting

DUET meeting is a collaborative meeting which held among the actors of procurement, namely the person from Purchasing, Stock Controller and User. This meeting normally discusses the daily operational progress, problem, and search for the solution if any problem occurred.

This solution then analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 2 Taking Out, meaning single out the only necessary subject to be discussed during the DUET meeting.
- b. Principle 10 Preliminary actions, meaning perform, before it is needed, the planning shall be included in the discussion of the DUET meeting and to be discussed near-action in the meeting.
- c. Principle 16 Partial or excessive action, meaning if 100 percent of an problem is hard to achieve using given solution method, then doing partial solution for the partial problem, for example backlog problem, even though the root of backlog is many, but trying to attack one of the problem to reduce the backlog, for example speed up the TE process, rather attacking all the problem.
- d. Principle 19 Periodic action, meaning the DUET meeting should be conducted regularly and also the schedule of DUET meeting should be made in order, i.e. monthly meeting.
- e. Principle 20 Continuity of a useful action, meaning carry on work continuously; the good practice of the DUET meeting should be conducted regularly.

- f. Principle 23 Feedback, meaning introduce feedback (referring back, cross-checking) in the DUET meeting to improve quality of the DUET meeting.

4.5.4.2 Review of Purchasing Objective

Solution from the Purchasing Department that described earlier based on the expert and experience of the employees of PT.A stated that one of the solutions is to review purchasing objectives, meaning the purchasing objectives shall be review i.e. yearly to adapt with the dynamic operation that generated from Drilling Sequences.

This solution then analyzed using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 2 Taking out, meaning single out only necessary practical objectives.
- b. Principle 3 Local Quality, meaning change an object's structure from uniform to non-uniform.
- c. Principle 5 Merging, meaning merge objective that have the same function/ purpose.
- d. Principle 23 Feedback, meaning Introduce feedback from operational level (referring back, cross-checking) the objective to improve the process or action.
- e. Principle 35, Parameter Changes, meaning change the concentration or consistency or change other parameter in the objective to be realistic.

4.5.4.3 Clear specification of PR

Clear specification of PR meaning to have Purchase Requisition must have clear specification of the material detail requirement, material specification shall be crystal clear, therefore the Purchase Engineer could know better the material they are going to purchase with the required quantity and giving the reliable supplier and also for the supplier that quoted the invitation will give the accurate material with the reasonable price.

This solution then are analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 2 Taking Out, meaning single out the only necessary part of the material that going to purchase but with clear specification rather than buying the material without knowing the detail specification.
- b. Principle 3 Local Quality, meaning if the material is available local with detail specification available produced by local fabricator is better than buying abroad without knowing the detail specification of material.
- c. Principle 5 Merging, meaning some related Material that have the same function should be created as one material with detail specification, for example the program of CAD.
- d. Principle 6 Universality, meaning the material should be universally available even though the P/N or some of the material is tailor made to the company, but the clear, detail speciation also as same description with other company.
- e. Principle 35 Parameter Changes, meaning if the material after being reviewed deemed having no clear specification then the parameter of the material should be change into more specific in the process of MCUR.

4.5.4.4 Conduct C&P staff competency assessment

Conduct C&P staff Competency assessment meaning to have the standard of qualification and regularly assess the capability of Purchase Engineer related to job that need to be performs.

This solution then are analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 2 Taking Out, meaning the test should be only related and relevant to the practical job-related, for example: regulation, system, etc.
- b. Principle 5 Merging, meaning for the competency assessment some that already have for example the competency for buyer from government, competency in C&P level Coordinator/Head Service can be merge into competency to the purchase engineer.

- c. Principle 9 Preliminary anti-actions, meaning other plan should be created and anticipated, if most of the Purchasing Engineer not passing the competency test.
- d. Principle 10 Preliminary actions, meaning to do the training or refreshment on the job knowledge, sharing knowledge, and also summary of the socialization for the latest regulation.
- e. Principle 19 Periodic actions, meaning the competency test could be done every 2 years basis, due to the regulation, systems is constantly changing.
- f. Principle 20 Continuity of a useful action, meaning if the action is deemed success to be implemented, therefore the action of creation competency test should be continue and periodically perform.

4.5.4.5 Socialization of Related Regulation

Solution of related regulation meaning to informed all related parties on the related regulation either to refresh or to inform new regulation that connected to the daily works.

This solution then are analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 2 Taking out, meaning single out only necessary practical objectives.
- b. Principle 6 Universality, meaning make the socialization platform to perform multiple regulations that related.
- c. Principle 19 Periodic Action, meaning the socialization should be performed regularly.
- d. Principle 23 Feedback, meaning the socialization is not one way direction but also facilitates the audience for the feedback.

4.5.4.6 Sharing Knowledge (Contact)

Sharing Knowledge meaning the socialization or related knowledge to the operational level personnel or known as CONTACT, which having the purpose to inform the best practice that already conducted.

This solution then are analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 3 Local Quality, meaning the sharing knowledge should be adapted with the daily operational utilization, the information should be applicable to be use corresponding with the local operation.
- b. Principle 6 Universality, meaning the information can be use universally in each service, despite of the different of commodities that procured.
- c. Principle 19 Periodic Action, meaning the sharing knowledge is better if regularly conducted.
- d. Principle 23 Feedback, meaning the sharing session should also cover the feedback session.
- e. Principle 26 Copying, meaning if the sharing knowledge are useful, then the knowledge can be adopted to the relevant case, to the relevant actors.

4.5.4.7 Enhance Procurement Compliances

Procurement Compliances is part of the PCC function in the Purchasing Department with its function as Procurement Control, Compliances and Expediting.

To find the Inventive Principles, the solution analyzed using contradiction matrix.

The solutions given are:

- a. Principle 5 Merging, meaning make operation in parallel, for example checking the DDQ which is regularly can be made once time in certain period of validity to shorten the time for approval.
- b. Principle 13 Inversion the other way around, meaning turn the object or process upside down, for example despite follow up the expediting of the material after the contract awarded, it would be better if the team do prior checking or searching for information on the possible delivery time, and or manufacturer capacity, therefore it will reduce the possibility of material late delivery.
- c. Principle 19 Periodic Action, meaning controlling the compliances for checking each contractual document should be done before it release,

therefore the document that produced for the contract, are the quality document.

- d. Principle 20 Continuity of a useful action, meaning checking for the Due Diligence of the vendor or applying penalty if supplier are late, already seen as useful action that should be continued.
- e. Principle 24 Intermediary, meaning use an intermediary carrier article or intermediary process, for example intermediary article should stated in the transition phase, novate of the contract are bound with the new operator and not automatically eliminate the obligation of the supplier to pay penalty if the operatorship already change.
- f. Principle 36 Phase Transition, meaning phenomena occurring during phase transitions between PT.A with new operator of PT.B, those phenomena should be capture in the operational of compliance team, for example the contract overdue, supplier penalty obligation.

4.5.4.8 Survey/ Field Visit /Workshop/Supplier premises

Survey or field visit or visit to workshop or visit to supplier premises, meaning if possible to be done, this action can have many advantage, such as checking the material, knowing if the supplier already comply with our company regulation. The visit to the field, not only can obtain more practical knowledge to the operation of Oil and Gas, but also can have the feedback from the end-user of the user regarding the purchasing department.

This solution then are analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 20 Continuity of a useful action, this field visit are important actions to be done and should have continuation.
- b. Principle 23 Feedback, meaning to gather the feedback from the end-user.
- c. Principle 25 Self-service, self-organization, meaning this action should be proactively manage and propose by the buyer, if required deemed necessary.

- d. Principle 34 Discarding and Recovering, meaning if the survey or field visit is already adequate, this visit may not to be continued further in certain period.

4.5.4.9 Issue Procurement Planning

Procurement planning meaning is the plan that should perform before the job done. Normally in the Procurement in Oil and Gas business, which adapted the concept of Production Sharing Contract (PSC), before we purchase we need to inform the government (SKKMigas) on the purchase above 500KUSD called Procurement List (Proc List), however some of the purchasing are below 500KUSD and it is based on budgetary basis. Therefore before we conduct the purchasing activity, we need to do and conduct Procurement list planning, the timeline of the procurement (as per prevailing regulation), for example needs Tender preparation; Internal Approval on Tender Document (internal circulation to Procurement Committee approval); Tender Registration (announcement to registration); Collecting document to Pre-bid meeting; Bid Submission; Bid Opening; Technical Evaluation; Commercial Evaluation; Negotiation; OE revision; Winner Recommendation preparation; Document circulation for Approval; Winner announcement.

These solutions then are analyzed using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 19 Periodic action, meaning creation of procurement planning shall be done all the time and periodically reviewed. For example if having the objection from bidders, by regulation shall have additional time, 3 working days to wait for the objection to be resolve, this change will effecting the whole planning.
- b. Principle 20 Continuity of useful actions, meaning for some of the Procurement Planning if already done professionally should be continued.
- c. Principle 23 Feedback, meaning open for the feedback from our related parties in regards of the Procurement Planning, for example feedback from

DUET which consist of team of Purchasing, Inventory Management and the End user.

- d. Principle 24 Intermediary, meaning for some of the procurement planning if above the threshold of 500KUSD required to inform SKK Migas as authorities, or more than 5 MUSD for Tender Approval and Above 20 MUSD for the winner approval; need intermediary team, for example from team of Coordination métier or from team of Method Planning Market to help determine the normal lead time of the approval from the authorities.
- e. Principle 26 Copying, meaning some of the commodities which have the same value, the estimation of the procurement lead time can be adopted from the previous.
- f. Principle 35 Parameter Changes, meaning if additional lead time identified, for example time for dispatcher to distribute document, idle time from the coordination to submit the document to the authorities, then the additional time should be included in the procurement planning in order to have reliable procurement planning based on the reality.

4.5.4.10 Regular training for Purchase Engineer

Regular training for Purchase Engineer meaning the training for the operational personnel, the knowledge that related to the works should be informed thru purchase engineer thru the training, and this should be conducted regularly. This solution then are analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 3 Local Quality, meaning the training should be adapted for the environment of the Purchasing in Oil and Gas industry not manufacturing industry.
- b. Principle 19 Periodic Action, meaning the training should be done regularly.
- c. Principle 25 Self-service, meaning if the Purchase Engineer feel in some area that he or she is not competence with, they could propose to their line management on the required training.

- d. Principle 36 Phase transition, meaning there are transition period from the training to the practical works to be applied.

4.5.4.11 Utilize and enhance REX+, Ensiklo

Utilize and enhance REX+, Ensiklo is a platform, thru the intranet web of PT.A, which are the tools of sharing knowledge and best practice across métier, entities, and affiliates.

This solution then are analyze using contradiction matrix, therefore finding some of the inventive principles. The solutions given are:

- a. Principle 2 Taking Out, meaning single out the only necessary part the best practice and sharing knowledge that are useful and applicable for the operation.
- b. Principle 3 Local Quality, meaning for the platform of the REX+ that across the affiliates to adapt the utilization on the local regulation in Indonesia.
- c. Principle 6 Universality, meaning the knowledge is universal and eligible to be use by many entities that related.
- d. Principle 19 Periodic Action, meaning the utilization and enhance the function of the REX+ and or Ensiklo should be done periodically.
- e. Principle 20 Continuity of useful action, meaning this best practice should still to be continued relevantly, to adapt the useful and applicable information.
- f. Principle 23 Feedback, meaning in this platform is better to have the feedback on the tools itself, to enhance the function either from the REX+ or Ensiklo.
- g. Principle 26 Copying, meaning the successful best practice could be taken and copying locally.

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CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

In this thesis, the researcher has been able to identify the Priority and Improvement of the Service from purchasing department.

In earlier discussion agreed the methods that used in the research are *ServQual* and *River Model* analysis. The result expressed below is the gap between the user's Target and or Expectation with the user's Actual and or Perception of the Quality of Service satisfaction from Purchasing Departments:

- a. The procurement process already included in the business framework and already has tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing. (-0.89)
- b. Knowledge on Know-How on the operation in OG applied in the procurement process (-0.78)
- c. Fastest procurement lead time (-0.67)
- d. Having the connection from other entities and actively seek to solve the problem (-0.67)
- e. Modern Procurement System e.g. Intranet Information System, SAP, ARIBA (-0.56)
- f. Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day (-0.56)
- g. Actively discussed on the problem that exist, and actively seek an answer to the experienced person (-0.56)
- h. Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc (-0.56)
- i. Knowledge are available just-in-time, user friendly and well applied (-0.56)
- j. Competitive price of goods/services and good negotiation skills (-0.44)

- k. Prompt solving problems of tender / during contract run-on (-0.44)
- l. Action and responsibility are well define among actors, and each actors are aware their role in the procurement (-0.44)
- m. Personnel capacity to organize, communicate well within internal organization (-0.44)
- n. There are tools to ease the communication or networking among procurement actors to promptly solving problem (-0.44)
- o. Proactive monitoring and Follow up orders (-0.33)
- p. On time delivery of orders (-0.33)
- q. Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up and socialize in the Contract and Procurement Events (-0.33)
- r. Technical competencies of C&P staff to create PO/Contract (-0.33)
- s. Willingness of C&P staff to listen to user's complain and solve the problem (-0.22)
- t. Capability of C&P staff to positively respond when corresponding to users (-0.22)

From the result Matrix *House of Quality* used to know the priority of Technical Response and using the *TRIZ* method for the Improving feature, but having the side effects of Worsening feature with *Altshuller's Principles*, as below:

1. Conduct regular DUET meeting (TC6; %-age of Importance 5.32%). Improving speed of the procurement lead time, but also worsening Extent of Automation; To improve using Altshuller's Principles of 2,10,16,19,20,23.
2. Review of purchasing objective (TC35; %-age of Importance 3.76%). Improving to ease the operation accordingly with the corridor of related regulation, but also some substance of the operation may loss; To improve using Altshuller's Principles of 2,3,5,23,35.
3. Clear specification of PR (TC3; %-age of Importance 3.75%).

- Improving speed of the procurement lead time, but also worsening in detecting and measuring the material with more detail specification on regards to the purchasing history; To improve using Altshuller's Principles of 2,3,5,6,35.
4. Conduct C&P staff competency assessment (TC4; %-age of Importance 3.59%). Improving the productivity of the purchasing engineer, but also worsening stress or pressure to the related purchasing engineer; To improve using Altshuller's Principles of 2,5,9,10,19,20.
 5. Socialization of related regulation (TC31; %-age of Importance 3.55%)
Improving the loss of information, but also worsening ease to repair, meaning for the contract that area in place will need further amendment; To improve using Altshuller's Principles of 2,6,19,23.
 6. Sharing Knowledge (Contact) (TC30; %-age of Importance 3.40%)
Improving the loss of information, but also worsening measurement of accuracy for the content of sharing knowledge for the implementation; To improve using Altshuller's Principles of 3,6,19,23,26.
 7. Enhance Procurement Compliances (TC10; %-age of Importance 3.29%)
Improving the reliability contractual document, but also worsening loss of time due to spend time to another circulation parties; To improve using Altshuller's Principles of 5,13,19,20,24,36.
 8. Survey/Visit Field/Workshop/Supplier premises (TC33; %-age of Importance 3.28%). Improving the adaptability on cases for purchasing actors, but also worsening loss of time due to time spend in surveying; To improve using Altshuller's Principles of 20,23,25,34.
 9. Issue procurement planning (TC16; %-age of Importance 3.28%).
Improving loss of time due to risk of losing time during the procurement process are mitigate by the plan, but also worsening loss of energy to create the massive procurement planning; To improve using Altshuller's Principles of 19,20,23,24,26,35.
 10. Regular training for Purchase Engineer (TC24; %-age of Importance 3.24%). Improving versatility in facing the problem during the contract creation, but also worsening stress or pressure for making quality

contractual document; To improve using Altshuller's Principles of 3,19,25,36.

11. Utilize and enhance REX+, Ensiklo (TC34; %-age of Importance 3.08%)

Improving loss of information due to the existing knowledge platform are decent contain the information, but also worsening Extent of automation during the contract creation; To improve using Altshuller's Principles of 2,3,6,19,20,23,26.

5.2 Recommendation

Some recommendations that can be proposed to the management of PT.A after implementation of the solution from this thesis, among other things are:

1. In order to be able to meet the expected service quality, need to prioritize the action resulted from the research but also considering improvement and worsening features.
2. Periodic review and monitoring needs to be done (e.g. every quarter) for the action plan that are resulted from this research.

While the recommendation for further studies of this thesis among other things are:

1. To add an element of cost allocation for the priority action. The cost allocation can be calculated based on the man-days required of implementing the action plan.
2. To categorize the degree of difficulty based on the resources planning in the company, such as timeline to implement the preventive action and manpower needed to implement the preventive action.

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APPENDIX 1 – RIVER QUESTIONNAIRE

A. INTRODUCTION

Dear Sir/Madam,

I am studying Master of Management Technology at Sepuluh Nopember Institute of Technology Surabaya, East Java, Indonesia, and I am currently distributing questionnaire for research purposes.

The questionnaire is designed to gather data for my research titled: *Service Quality Analysis and Improvement of Purchasing Department in Oil and Gas Company (Case Study: PT.A)*.

The questionnaire will consist of two parts:

Section 1: Perception of Quality Service of Purchasing Department.

Section 2: Target of Purchasing Department's Services

The questionnaire should take no more than 10 minutes to complete. Please return the completed questionnaire in an email attachment. Please be assured that your response will be treated in strict confidence. Please be informed this research is for the purpose of the Academic research only.

Thank you for your kind understanding and cooperation.

Balikpapan, 2016

Warm Regards,

Hendra Wahyudi

No Quest : _____

Date of Interview : _____

Respondent Profile:

You are requested to write down information about yourself:

- Name :
- Position/Job Title :
- Division/Department/Services :
- Service years in the Company :
- Age :
- Education :

B. DESCRIPTION

Instruction: Cross (X) on the number provided in accordance with the answer you choose. Choose only one answer for each question, unless there are specific instructions.

1. Tick 5 if you feel the Service already in "Level Way We Work".
2. Tick 4 if you feel the Service already in "Consistently apply".
3. Tick 3 if you feel the Service already in "Action".
4. Tick 2 if you feel the Service already in "React".
5. Tick 1 if you feel the Service already in "Awareness".

C. QUESTIONNAIRE

Variable	Attribute	Score				
	Target	5	4	3	2	1
KM Strategy	The procurement process already included in the business framework and already has tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing.					
	Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up from Supply Chain Fundamental					
Leadership	Action and responsibility are well define among actors					
	Personnel capacity to organize, communicate well within internal organization					
Networking	There are tools to ease the communication or networking among procurement actors					
	Having the connection from other entities to solve the problem outside Purchasing Department					
Learning	Actively discussed on the problem that exist, and actively seek an answer to the experienced person					
	Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc					
Capturing	Knowledge on Know-How on the operation in OG applied in the procurement process					
	Knowledge are available just-in-time and user friendly.					
Variable	Attribute	Score				
	Actual	5	4	3	2	1
KM Strategy	The procurement process already included in the business framework and already has tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing.					
	Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up from Supply Chain Fundamental					
Leadership	Action and responsibility are well define among actors					

	Personnel capacity to organize, communicate well within internal organization					
Networking	There are tools to ease the communication or networking among procurement actors					
	Having the connection from other entities to solve the problem outside Purchasing Department					
Learning	Actively discussed on the problem that exist, and actively seek an answer to the experienced person					
	Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc					
Capturing	Knowledge on Know-How on the operation in OG applied in the procurement process					
	Knowledge are available just-in-time and user friendly.					

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APPENDIX 2 – SERVQUAL QUESTIONNAIRE

A. INTRODUCTION

Dear Sir/Madam,

I am studying Master of Management Technology at Sepuluh Nopember Institute of Technology Surabaya, East Java, Indonesia, and I am currently distributing questionnaire for research purposes.

The questionnaire is designed to gather data for my research titled: *Service Quality Analysis and Improvement of Purchasing Department in Oil and Gas Company (Case Study: PT.A)*.

The questionnaire will consist of two parts:

Section 1: Expectation of Quality Service of Purchasing Department.

Section 2: Actual of Purchasing Department's Services

The questionnaire should take no more than 10 minutes to complete. Please return the completed questionnaire in an email attachment. Please be assured that your response will be treated in strict confidence. Please be informed this research is for the purpose of the Academic research only.

Thank you for your kind understanding and cooperation.

Balikpapan, 2016

Warm Regards,

Hendra Wahyudi

No Quest : _____

Date of Interview : _____

Respondent Profile:

You are requested to write down information about yourself:

- Name :
- Position/Job Title :
- Division/Department/Services :
- Service years in the Company :
- Age :
- Education :

B. DESCRIPTION

Instruction: Cross (X) on the number provided in accordance with the answer you choose. Choose only one answer for each question, unless there are specific instructions.

1. Tick 5 if you feel the Service is “Very Important”.
2. Tick 4 if you feel the Service is “Important”.
3. Tick 3 if you feel the Service is “Moderate”.
4. Tick 2 if you feel the Service is “Less Important”.
5. Tick 1 if you feel the Service is “Not Important”.

C. QUESTIONNAIRE

Variable	Attribute	Score				
	Expectation	5	4	3	2	1
<i>Tangible</i>	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA					
	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day					
<i>Reliability</i>	Fastest procurement lead time					
	Competitive price of goods/services and good negotiation skills					
<i>Responsiveness</i>	Proactive monitoring and Follow up orders					
	Prompt solving problems of tender / during contract run-on					
<i>Competence</i>	Technical competencies of C&P staff to create PO/Contract					
	On time delivery of orders					
<i>Courtesy</i>	Willingness of C&P staff to listen to user's complain and solve the problem					
	Capability of C&P staff to positively respond when corresponding to users					
Variable	Attribute	Score				
	Perception	5	4	3	2	1
<i>Tangible</i>	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA					
	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day					
<i>Reliability</i>	Fastest procurement lead time					
	Competitive price of goods/services and good negotiation skills					
<i>Responsiveness</i>	Proactive monitoring and Follow up orders					
	Prompt solving problems of tender / during contract run-on					
<i>Competence</i>	Technical competencies of C&P staff to create PO/Contract					

	On time delivery of orders					
<i>Courtesy</i>	Willingness of C&P staff to listen to user's complain and solve the problem					
	Capability of C&P staff to positively respond when corresponding to users					

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APPENDIX 3 – DATA SUMMARY OF SERVQUAL_EXPECTATION

Expectation	Tangible		Reliability		Responsiveness		Competence		Courtesy	
	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	Fastest procurement lead time	Competitive price of goods/services and good negotiation skills	Proactive monitoring and Follow up orders	Prompt solving problems of tender / during contract run-on	Technical competencies of C&P staff to create PO/Contract	On time delivery of orders	Willingness of C&P staff to listen to user's complain and solve the problem	Capability of C&P staff to positively respond when corresponding to users
Q	QE1	QE2	QE3	QE4	QE5	QE6	QE7	QE8	QE9	QE10
1	5	5	5	5	5	5	5	5	5	5
2	4	4	4	4	4	4	4	4	4	4
3	5	5	5	5	5	5	5	5	5	5
4	5	4	5	5	5	5	5	5	5	5
5	4	5	5	5	5	5	5	5	5	5
6	4	4	5	4	5	5	4	5	4	4
7	5	5	5	5	5	5	5	5	5	5
8	4	4	4	4	4	4	4	4	4	4
9	4	4	4	4	4	4	4	4	4	4

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APPENDIX 4 – DATA SUMMARY OF SERVQUAL_PERCEPTION

Perception	Tangible		Reliability		Responsiveness		Competence		Courtesy	
	Modern Procurement System e.g. Intranet Information System, SAP, ARIBA	Supply Chain communication events e.g. Procurement Socialization, Stock Workshop, C&P Day	Fastest procurement lead time	Competitive price of goods/services and good negotiation skills	Proactive monitoring and Follow up orders	Prompt solving problems of tender / during contract run-on	Technical competencies of C&P staff to create PO/Contract	On time delivery of orders	Willingness of C&P staff to listen to user's complain and solve the problem	Capability of C&P staff to positively respond when corresponding to users
Q	QP1	QP2	QP3	QP4	QP5	QP6	QP7	QP8	QP9	QP10
1	4	4	4	4	4	4	4	4	4	4
2	4	4	4	4	4	4	4	4	4	4
3	2	2	2	4	4	4	4	5	5	5
4	5	4	5	4	5	5	5	5	5	5
5	4	5	5	5	5	5	5	5	5	5
6	3	3	3	3	4	3	3	3	3	3
7	5	5	5	5	5	5	5	5	5	5
8	4	4	4	4	4	4	4	4	4	4
9	4	4	4	4	4	4	4	4	4	4

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APPENDIX 5– DATA SUMMARY OF RIVER MODEL_TARGET

Target	KM Strategy		Leadership		Networking		Learning		Capturing	
	The procurement process already included in the business framework and already have tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing.	Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up and socialize in the Contract and Procurement Events	Action and responsibility are well define among actors, and each actors are aware their role in the procurement	Personnel capacity to organize, communicate well within internal organization	There are tools to ease the communication or networking among procurement actors to promptly solving problem	Having the connection from other entities and actively seek to solve the problem	Actively discussed on the problem that exist, and actively seek an answer to the experienced person	Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc	Knowledge on Know-How on the operation in OG applied in the procurement process	Knowledge are available just-in-time, user friendly and well applied
R	RT1	RT2	RT3	RT4	RT5	RT6	RT7	RT8	RT9	RT10
1	4	4	4	4	4	4	4	4	4	4
2	5	5	5	5	5	5	5	5	5	5
3	5	5	5	4	4	4	5	5	4	4
4	5	5	5	5	5	5	5	4	4	4
5	3	3	3	3	3	3	3	3	3	3
6	5	5	5	5	5	4	4	5	5	4
7	5	5	5	5	5	5	5	5	5	5
8	4	4	4	4	4	4	4	4	4	4
9	4	4	4	4	4	4	4	4	4	4

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APPENDIX 6– DATA SUMMARY OF RIVER MODEL_ACTUAL

Actual	KM Strategy		Leadership		Networking		Learning		Capturing	
	The procurement process already included in the business framework and already have tools (i.e. Intranet, CMS) that could help learning before doing, learning during doing and after doing.	Contract Implementation already implement and anticipate the strategy related with preparation until contract follow up and socialize in the Contract and Procurement Events	Action and responsibility are well define among actors, and each actors are aware their role in the procurement	Personnel capacity to organize, communicate well within internal organization	There are tools to ease the communication or networking among procurement actors to promptly solving problem	Having the connection from other entities and actively seek to solve the problem	Actively discussed on the problem that exist, and actively seek an answer to the experienced person	Sharing Knowledge are actively and effectively implemented, incl. in the events, i.e. SC Day, Proc Soc	Knowledge on Know-How on the operation in OG applied in the procurement process	Knowledge are available just-in-time, user friendly and well applied
R	RA1	RA2	RA3	RA4	RA5	RA6	RA7	RA8	RA9	RA10
1	4	4	4	4	4	4	4	4	4	4
2	5	5	5	5	5	5	5	5	5	5
3	1	4	3	3	2	2	2	2	1	1
4	3	5	5	5	5	3	5	4	3	3
5	2	2	2	2	2	2	2	2	2	2
6	4	4	4	3	4	3	3	4	3	4
7	5	5	5	5	5	5	5	5	5	5
8	4	4	4	4	4	4	4	4	4	4
9	4	4	4	4	4	4	4	4	4	4

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BIOGRAPHY

Hendra Wahyudi



The writer was born at Surabaya, 3rd June 1983. The writer finished the Undergraduate degree as Bachelor of Engineering in Industrial Engineering ITB, and took the Postgraduate degree as Master of Management Technology ITS.

In early of His career, the writer was working as a Consultant and Banker in Jakarta, Singapore, until move to Total in 2007 as different Industry, which runs in Oil and Gas Business. In the beginning of his career in Total, the writer was working as the Method and Planning Engineer in Balikpapan until 2011. Then the writer get chance to have the International Assignment in Paris, France, then after returning to Indonesia the writer holds the position in the Purchasing. Currently the writer holds the position as Head of Section for the purchase of Material of Drilling, Well Services and Operational supports.