

# Chartering Services Development with the QFD Approach: Case Study on Liquid Freight Shipping Companies

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**Abstract:-** According to data from the 2016 Center for Energy and Mineral Resources Data and Information Technology at the Ministry of Energy and Mineral Resources in 2016, it is known that fossil fuel use is still high at 95.58% compared to renewable energy, which is 4.42%. With the geographical structure as an archipelagic country, it requires transportation facilities for transporting fuel both domestically and abroad (import). This study aims to analyze the development of new products / services using the Quality Function Deployment (QFD) method. The implementation of this method is expected to be able to increase customer satisfaction by improving the quality of management services for tanker shipping operations. Data was collected through interviews, field observations and library studies. Consumers in this case Charterers prefer ships that are under 15 years old, equipped with the latest technology for cargo monitoring, professional ship crew and compliance with safety and security standards. Claims on fuel costs (Bunkers) and the excess fine of time on demand (Demurrage) are not a priority of consumer needs but are still efficient with the planning and coordination of shipping operations that are good and correct in accordance with shipping standards.

**Keyword:-** Quality Function Deployment (QFD), Voice of Customer, Technical Characteristic, Chartering, Term of Charter, Charter Party.

## I. INTRODUCTION

At the beginning of 1962 to 2008 Indonesia was known as a member of the Organization of the Petroleum Exporting Countries, which meant that oil and gas commodities were the main source of income for export earnings. In line with the time of Indonesia's population growth according to the 2010 statistical data is 1.54% / year and the average fuel consumption from 2000 to 2014 increased significantly by 1.74% per year, making Indonesia a Net Importer country in 2008 until now.

According to data from the 2016 Center for Energy and Mineral Resources Data and Information Technology at the Ministry of Energy and Mineral Resources in 2016, it is known that fossil fuel use is still high at 95.58% compared to renewable energy, which is 4.42%. With the geographical structure as an archipelagic country, it

requires transportation facilities for transporting fuel both domestically and abroad (import).

Means of transporting fuel oil both product oil and crude oil using tanker vessels. PT XYZ Tbk, which is engaged in liquid cargo shipping service business, has a fleet of oil, gas and chemical tankers to meet the needs of the fuel transportation.

PT XYZ Tbk was established in 2005 on the basis of Presidential Instruction No.5 of 2005 concerning the Empowerment of the National Shipping Industry in which the Cabotage Principle is contained. Whereas the principles and definitions of cabotage in Indonesia are contained in Law Number 17 of 2008 concerning Shipping Article paragraph 1 and 2, namely that (1) domestic sea transportation activities are carried out by national sea transportation companies using Indonesian-flagged vessels and manned by nationally-owned crew Indonesia and (2) foreign ships are prohibited from carrying passengers and / or goods between islands or between ports in Indonesian waters.

The objectives of the application of the cabotage principle include the protection of the transportation industry in the territory of the Republic of Indonesia by air and sea as well as a means of embodying the implementation of National Defense and Security.

## II. IMPROVEMENT OF CHARTERING SERVICES IN OIL & GAS SHIPPING INDUSTRY USING QFD

Liquid Freight Shipping Industry in this case the fleet uses tankers consisting of 3 types of oil and gas products, namely: Crude Oil Tanker, Product Oil Tanker and Gas Tanker.

Liquid cargo transportation services using tankers have strict quality standards, especially environmental safety and security. Orders from consumers are obtained through a tender process so that consumer desires are stated as tender requirements.

Quality Function Deployment (QFD) was developed by Yoji Akao (Japan) in 1966 and in 1972 it was industrially demonstrated at the Mitsubishi Heavy Industries (Bolar, 2017). Traditionally QFD is widely used in decision making in product development and production

fields (Eldemanna et al., 2017). Up to now, QFD has been used not only in the initial production areas, but also in the non-production areas, such as services, software industry, medical & health care and etc (LI Na et al., 2012).

QFD should be carried out by cross-functional teams whose job is to complete one or more series of matrices that lead to a range of insights on how to best produce superior products or services and how to prioritize research and development activities in the future.

The purpose of this research is to apply the QFD concept and the HOQ tool for developing new services in the chartering service for shipping liquid cargo.

**A. Quality Function Deployment (QFD)**

Quality Function Deployment (QFD) is a very well-known design method, developed in late 1960 in Japan, and used with the aim of translating Customer Needs (CNs) and wants into technical design requirements by means of the use of a series of matrices, called House of Quality (HoQ), with the objective to satisfy the customers' expectations improving the quality level of the product at the same time (Lapinskiene, 2017).

QFD is a method for identifying customer attributes and creating relationships that help marketers and technicians in designing a product or service.

Many QFD practitioners point out that this is a process of debate among cross-functional team members in reaching consensus on matrix formation as a learning process. QFD is currently used in almost every type of industry and application of products and services, consumers (B2C) and commercial (B2B), high technology and low technology, and others.

QFD can be developed not only one matrix (House of Quality), but even four matrices. This form a sequential relationship are:

- Customer needs for performance measures
- Performance Measures for Features or Solutions
- Features or Solutions for Spare Parts Specifications
- Section Specifications for Manufacturing Processes.

➤ **QFD Matrix (House of Quality)**

The purpose of applying QFD in logistics service design is to ensure that the eventual service designs meet customer requirements. A key technique of QFD is HOQ. It uses a planning matrix to capture what the customer wants and how a company is going to meet those requirements (Slack et al., 2010). As can be seen in Figure 1, HOQ includes six phases:

1. identify customer requirements (WHATs) and evaluate those weights in the left wall of the house;
2. compare the competitiveness of the service in the right wall;
3. translate customer requirements into service design characteristics (HOWs) just below the roof;

4. define the relationship between WHATs and HOWs in the central deployment matrix or called relationship matrix;
5. define the relationships between the various service design characteristics in the correlation matrix in the roof; and
6. design the target values of the service on the ground floor of the house, which is the absolute importance for each service design characteristic.

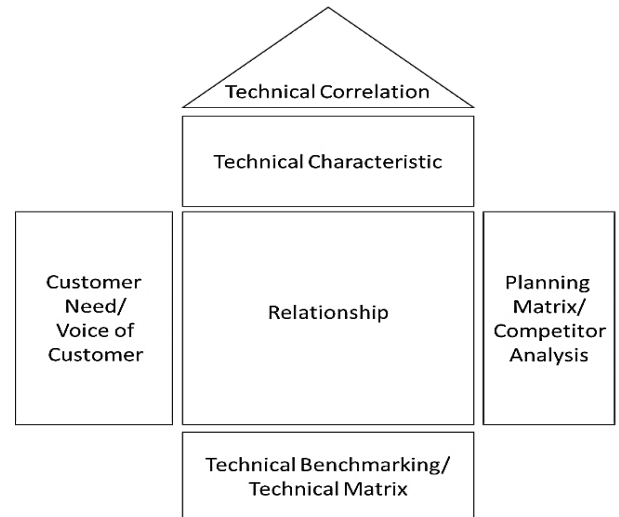


Fig. 1:- Matrik QFD (House of Quality)

**B. Liquid Freight Services**

Sea transportation as a means of transportation between islands and between continents, provides an opportunity for providers of transportation services in the waters not to be supposed to buy owned and operated vessels. If business people face a state of shortage of transportation modes, then the way out to overcome this problem is to hire a ship (charterer) from the owner (ship owner) to then operate to meet the needs.

PT XYZ Tbk as a ship owner (ship owner) offers boat rental services to tenants (charterers) in this case also called consumers of PT XYZ Tbk. The main consumers of charterers who use transportation services through the oil fuel chartering system of PT XYZ Tbk are cargo owners and / or refineries. Nearly 70% of PT XYZ Tbk's fleet is used to transport fuel oil owned by state-owned oil companies in the form of Crude Oil, Product Oil, Liquefied Natural Gas (LNG) and Processed Oil (LPG) Gas.

The tender mechanism is applied to get these fuel transportation orders. After the tender is obtained, a Term of Charter (TC) will be made in which the first party as the owner of the cargo in this case the state / private oil company as the tenant and the second party PT XYZ Tbk as the ship owner to cooperate in transporting a number of material loads fuel oil from one origin terminal (fuel oil refinery) to one or several oil fuel distribution terminals.

This can be explained through the Fuel Oil Distribution Flow Chart;

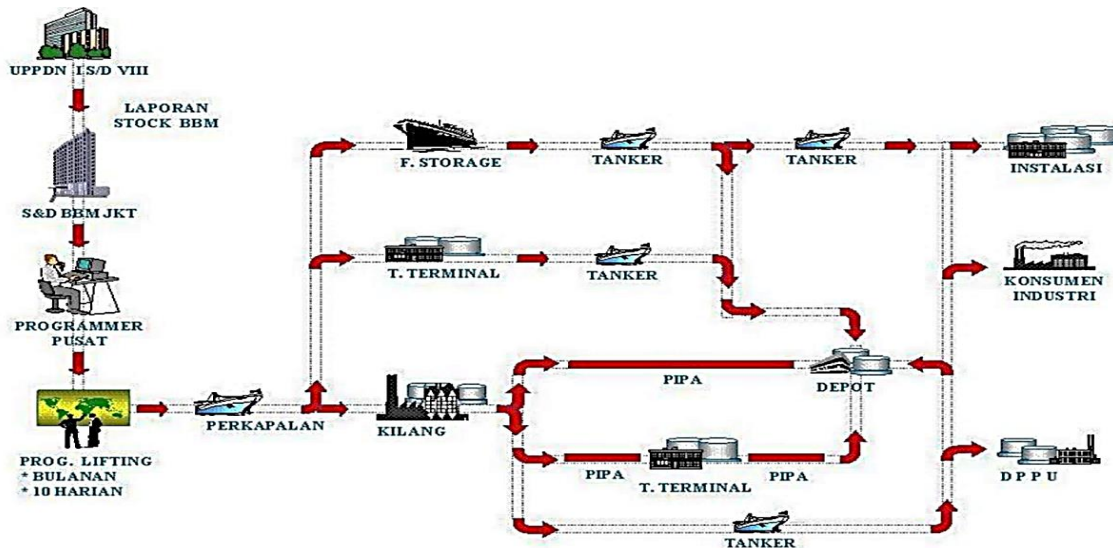


Fig. 2:- Fuel Oil Distribution Flow Chart  
Source: BPH Migas

Inside of the tanker rental agreement, the obligation of the tenant / charterer is to pay for all shipping operational costs incurred during the employment contract, especially ship fuel and all port clearance costs. Whereas the obligation of the ship owner is to carry out the task of transporting fuel cargo to the destination terminal according to the target time, amount and shipping operational costs in accordance with the Term of Charter agreement. The ship owner is also obliged to always report information and data related to the movement of the ship, the condition of the cargo and loading and unloading transactions during the period of the ship lease contract.

The shipping industry is a complex industry with strong implications in the global trade. Transportation costs can significantly affect the development of emerging economies due to its impact in the cost of their products. Savings in the use of energy can have important implications in climate change and the cost of products at global scale (Otheitis&Kunc, 2014).

The policy of PT XYZ Tbk assigns ship engineering management to a subsidiary of PT GHIJ and crew management to PT KLMN. In this case PT XYZ Tbk also has the need to coordinate information and data related to the implementation of technical management and ship crews.

The transportation of strategic fuel content cannot be separated from the risks that can have a detrimental effect on the tenants and shipowners. Some of the risks that may arise are:

- Increased costs of ship bunkers
- Loss of total fuel load
- Increased spare parts and ship maintenance costs
- The swelling of port costs due to technical issues of loading and unloading fuel
- The emergence of chartered claims costs to ship owners due to shipping delays due to the speed and movement

of the ship not in accordance with the agreement of the cooperation contract.

- Complain the charterer to the ship owner due to the delay in the submission of report / information on vessel data.
- And others.

In addition to the risks mentioned above, the shipping industry also has the potential risk of bureaucratic fraud and field fraud which results in inefficiencies and high costs. This potential fraud can be categorized as a crime.

### III. RESULT AND DISCUSSION

#### A. Customer Need/Voice of Customer

Aman A. Bolar (2017) define that a primary input to the QFD process is customer requirements that are normally based on surveys and questionnaire. However, these customer requirements are dynamic in the sense that depending on time and space the expectation could vary.

Is the original voice of the customer with the customer's language (voice of customer), contains the customer desires (customer need) on the quality of products / services. Customer voice (Voice of Customer / Customer Need) which is then translated into the quality desired by the customer.

Regarding the multiplicity of different characteristics of similar products in today's competitive industrial world, selection of most suitable characteristics for the customer satisfaction is crucially important. The "voice" of customer is a vital element in this process. Once unleashed, this voice continues to demand more and more from the marketplace and beyond. Companies who supply products win when also the customer wins (Moldovan, 2014)

Consumers in the liquid cargo transportation industry are business entities / business companies that need chartering services for the cargo of liquid products they

need. The process of finding partners for leasing services for transporting liquid cargo is done through a tender process. The final result of the tender process is a document of agreement between the ship owner (ship owner) who agrees to lease his ship and the charterer who agrees to rent the vessel. The ship rental agreement document is called Charter Party. Customer Need / Voice of Customer is stated in the specification requirements and articles of agreement in the Charter Party.

Customer Need/Voice of Customer presented in Figure 3.

Voice Of Customer		
Quality	1. Vessel age under 20 years old	4
	2. Good vessel certification	3
	3. Tolerance los of 10%	4
	4. The accuracy of delivery for every voyage	5
	5. Zero accident	3
SCM	6. 24 hour coordination and information support	2
Comm unicat	7. Complete and Timely Reporting	2
Opsional Value	8. No Demurrage Charges	1
	9. Claim Bunker according to Charter Party	1

Fig. 3:- Customer Need/Voice of Customer

### B. Technical Characteristic

The results of voice translation / customer desires (voice of customers) are directed towards factors and technical language. This is the answer to the demand for quality and product / service features that the customer wants. The main practice of QFD is based on the technical classification of the product and on the improvement of the design by utilizing proper technical particulars (Duru et al., 2011)

Technical characteristics of the product for leasing services for transporting liquid cargo include aspects of fulfilling shipping industry standards, both operational, security and safety standards, and international and government certification.

Technical Characteristic presented in Figure 4.

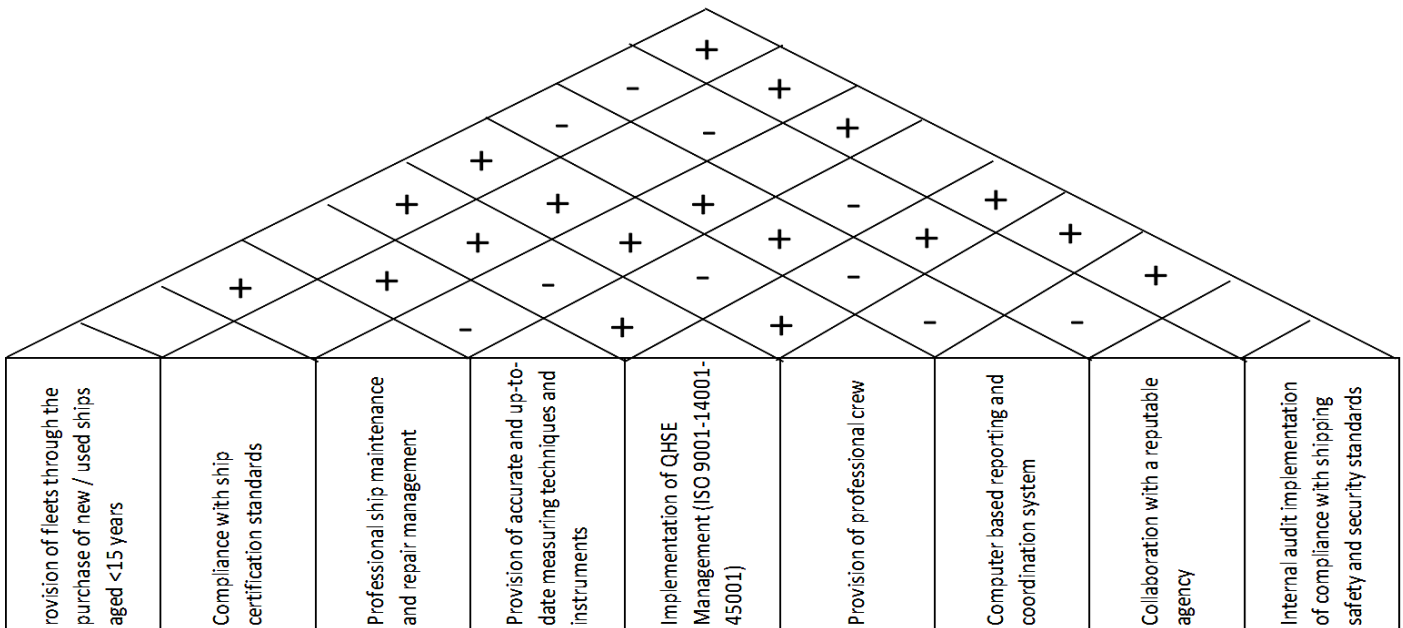


Fig. 4:- Technical Characteristic

C. Relationship

Describe the strength of quality relationships demanded by consumers with product quality characteristics. Relationship presented in Figure 5.

Voice Of Customer		revision of fleets through the purchase of new / used ships aged <15 years	Compliance with ship certification standards	Professional ship maintenance and repair management	Provision of accurate and up-to-date measuring techniques and instruments	Implementation of QHSE Management (ISO 9001-14001-45001)	Provision of professional crew	Computer based reporting and coordination system	Collaboration with a reputable agency	Internal audit implementation of compliance with shipping safety and security standards
Quality	1. Vessel age under 20 years old	4	●							
	2. Good vessel certification	3		○	△	○				
	3. Tolerance los of 10%	4			●	△	△			
	4.The accuracy of delivery for every voyage	5					●			
	5. Zero accident	3			○					●
SCM	6. 24 hour coordination and information support	2				△		△		
Comm unicat	7. Complete and Timely Reporting	2				○		△		
Opsonal Value	8. No Demurage Charges	1							△	
	9. Claim Bunker according to Charter Party	1	△							△

Fig. 5:- Relationship

Giving weight (weighted) with symbols shows the level of relationships (relationships) between elements, so that it will be known the relationship of high, medium, low and none at all. Relationship weighted presented in Figure 6

Relationship	High	Medium	Low
	●	○	△
	9	3	1

Fig. 6:- Relationship Weighted

D. Competitor Analysis/Planning Matrix

Quality evaluation and planning in this section is carried out very carefully because the development of this section will produce an assessment that is the basis for decision making towards the future service products.

The condition of PT XYZ Tbk is compared to competitors who are the main competitors and quality requests are based on the results of the calculation of the relationship points as mentioned above.

The weight of features is calculated so that the highest value will be obtained by taking into account the optimal utilization of company resources.

Competitor Analysis/Planning Matrix presented in Figure 7.

5	2	3	5	1,00	1,00	4,00	11,40
3	5	3	5	1,40	1,40	5,88	16,75
4	3	3	4	1,00	1,00	4,00	11,40
3	5	3	4	1,20	1,20	7,20	20,51
2	1	3	3	1,20	1,20	4,32	12,31
3	5	2	4	1,20	1,10	2,64	7,52
2	4	3	4	1,40	1,30	3,64	10,37
1	4	1	4	1,60	1,00	1,60	4,56
1	1	1	3	1,40	1,30	1,82	5,19
CS Rating our textbook	CS Rating Competitor A	CS Rating Competitor B	Our Planned CS Rating	Improvement Factor	Sales Point	Overall Weighting	% of Total Weight

Fig. 7:- Competitor Analysis/Planning Matrix

*E. Technical Matrix*

Calculation of the value of each result of the quality requested and the quality characteristics developed is of importance. The technical design of products / services is compared to competitors so that the designs to be developed are planned with features or qualities that are superior to competitors (Customer Benchmarking).

Ultimately, the quest for quality in transportation is about development of institutions which generate stable outcomes by linking supply and demand for quality, rather

than imposing standards for outcomes and products. Thus, a policy framework for sustainable commercial transportation requires situationally effective "meta governance" that could entrust actors to craft their own rules, norms, and strategies for quality assurance (Daria,2015).

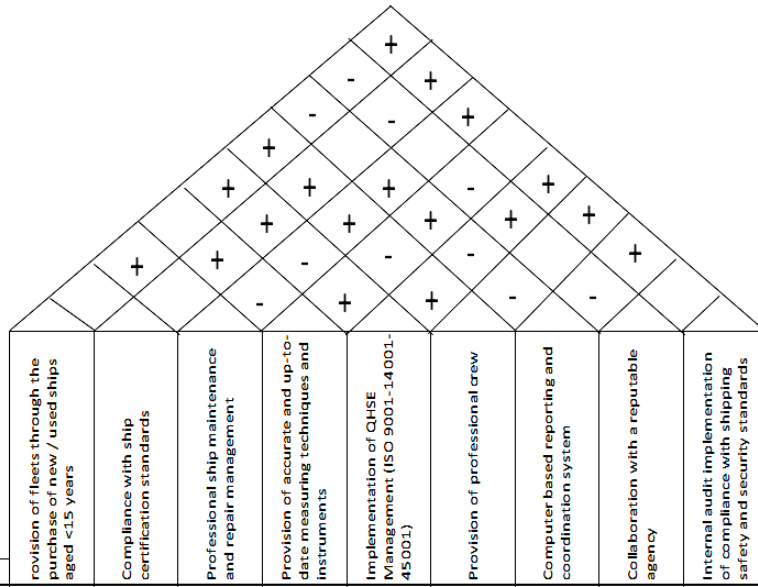
Based on the results of the rating scale, a scientific decision on the target products / services will be produced. This is the answer to the quality of consumer demand. Technical Matrix presented in Figure 8.

Technical Priorities		37,82	17,64	5,88	48,96	27,92	68,80	6,28	1,60	40,70
% of Total Priorities		14,80	6,90	2,30	19,15	10,92	26,92	2,46	0,63	15,92
Technical Benchmark	Our Product	Ship Purchase	80%	Manual monitoring & Reporting by Tech.Sup.	Manual metering	Adopted QHSE Manag System	Crew Develop as usual	GPS and Email reporting system	Based on Agency list	Monitored by Safety Officer
	Competitor A	Party Boat Rentals 3	90%	Manual monitoring & Reporting by Tech.Sup.	Manual metering	Adopted QHSE Manag System	Crew Develop as usual	GPS and Email reporting system	Based on Agency list	Monitored by Safety Officer
	Competitor B	There is no added Fleet	75%	Manual monitoring & Reporting by Tech.Sup.	Manual metering	Adopted QHSE Manag System	Crew Develop as usual	GPS and Email reporting system	Based on Agency list	Monitored by Safety Officer
Design Target		Purchase of 4 secondhand ships	100%	Auto Monitoring by Vessels Maintenance Apps	Auto detect metering	Audit QHSE Management based on Risk Assessment	Promoted & supported Crew Develop.	Auto share & reported by Satellite System Reporting Apps	List of Evaluated Agency & Partners	Monitored by Safety Audit Teams

Fig. 8:- Technical Matrix

The QFD application contributes to better traceability in the process. It is now possible for the project team to trace back from the solution to customer needs (Gremyr

and Raharjo, 2011). House of Quality New Product of Chartering Services presented in Figure 9



Voice Of Customer		revison of fleets through the purchase of new / used ships aged <15 years	Compliance with ship certification standards	Professional ship maintenance and repair management	Provision of accurate and up-to-date measuring techniques and instruments	Implementation of QHSE Management (ISO 9001-14001-45001)	Provision of professional crew	Computer based reporting and coordination system	Collaboration with a reputable agency	Internal audit implementation of compliance with shipping safety and security standards								
Quality	1. Vessel age under 20 years old	4	●								5	2	3	5	1,00	1,00	4,00	11,40
	2. Good vessel certification	3	○	△		○					3	5	3	5	1,40	1,40	5,88	16,75
	3. Tolerance los of 10%	4			●	△	△				4	3	3	4	1,00	1,00	4,00	11,40
	4. The accuracy of delivery for every voyage	5					●				3	5	3	4	1,20	1,20	7,20	20,51
	5. Zero accident	3			○					●	2	1	3	3	1,20	1,20	4,32	12,31
SCM	6. 24 hour coordination and information support	2				△		△			3	5	2	4	1,20	1,10	2,64	7,52
Comm unikat	7. Complete and Timely Reporting	2				○		△			2	4	3	4	1,40	1,30	3,64	10,37
Opsonal Value	8. No Demurage Charges	1							△		1	4	1	4	1,60	1,00	1,60	4,56
	9. Claim Bunker according to Charter Party	1	△							△	1	1	1	3	1,40	1,30	1,82	5,19
Technical Priorities			37,82	17,64	5,88	48,96	27,92	68,80	6,28	1,60	40,70	CS Rating our textbook CS Rating Competitor A CS Rating Competitor B Our Planned CS Rating Improvement Factor Sales Point Overall Weighting % of Total Weight						
% of Total Priorities			14,80	6,90	2,30	19,15	10,92	26,92	2,46	0,63	15,92							
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Design Target		Purchase of 4 secondhand ships	100%	Auto Monitoring by Vessels Maintenance Apps	Auto detect metering	Audit QHSE Management based on Risk Assessment	Promoted & supported Crew Develop.	Auto share & reported by Satellite System Reporting Apps	List of Evaluated Agency & Partners	Monitored by Safety Audit Teams								

Fig. 9:- House of Quality New Product of Chartering Services

The final results of product / service development with the QFD method by translating the quality demanded by consumers into features of product / service functions

become easier to understand and then make decision management choices. New Products / Services Developed presented in Figure 10

Quality requested	Product / Service Function Features
1. Vessel age under 20 years old	Fleet of ships with a maximum age of 15 years old
2. Good vessel certification	Certified ship
3. Tolerance loss of 10%	The ship is equipped with the latest
4. The accuracy of delivery for every voyage	The crew is professionally certified
5. Zero accident	Compliance with Security and Safety Standards
6. 24 hour coordination and information support	Compliance with SOPs
7. Complete and Timely Reporting	Compliance with SOPs
8. No Demurrage Charges	Professional Port Administration
9. Claim Bunker according to Charter Party	Ship Fleet with more efficient fuel consumption

Fig. 10:- New Products / Services Developed

#### IV. CONCLUSION

Quality Function Deployment (QFD) can be used in developing products / services starting from the product planning stage (product planning) to the stage of the quality control process. But this research is limited to only the product / service planning stage.

The final results of the QFD target values are product / service development priorities are: (1) Procurement/purchase of ships under 15 years old, (2) Use of the latest technology "Auto Detect Metering" as load monitoring, (3) Professional Crews, (4) Implementation of Internal Audit as a form of compliance with safety and security standards.

Claims on fuel costs (Bunkers) and the excess fine of time on demand (Demurrage) are not a priority of consumer needs but are still efficient with the planning and coordination of shipping operations that are good and correct in accordance with shipping standards.

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