



Beyond Standard: Do The Marine Engineers Competence?

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ABSTRACT

Indonesia has an important role in the world maritime industry through a large number of Indonesian registered ships as well as the number of marine engineers. In this paper, we study the perceptions and expectations of seafarers' competence, especially Indonesian marine engineers. This is very important for policy makers to know which indicators are gaps so that solutions and improvement can be applied. This research is also important for the shipping companies to understand what is the strong factor of Indonesian marine engineers as well as the area which needs to be developed during on board ship. The gap analysis method is applied to compare the expectation and the perception of the competency variables. The results of this study provide feedback to the marine engineers to further enhance competence during individual ship work. To support this, a marine engineer may propose the application for training on board or training at a training institution while on vacation. In addition to these training institutions could also use the results of this study to increase the competence areas considered by the engineers who are less satisfied. The shipping company may also undertake enhanced training for shipboard engineers on board with ongoing training programs.

Keywords: Competency, Marine engineer, importance performance analysis, gap analysis.

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1. Introduction

Indonesia is an archipelagic state which consists of 70% of sea area. The sea area of Indonesia covers 5.8 million km square with length of coast line is 95,181 km. Based on this fact, the sea transportation has important role to connect the 17,504 islands. One of the sea transportation mode is ship which the number of Indonesian registered ships are more than 17.000 ships. As the ship needs to be operated by crew, one of the crew profession is the marine engineers.

The number of Indonesian seafarers are 875.933 in 2017. These number includes the number of seafarers who work for foreign ships. For the marine engineers, the number is around 47.000. Their certificates are according to the requirements of Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 1978 Amendments 2010.

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The marine engineers, many of whom work in national companies and few of them work for international companies. Whereas in accordance with the data from BIMCO in 2015 there is still a shortage of thousands of ship officers including marine engineers. This should be used by Indonesian marine engineers to compete filling the international market. Of course to fill the international market Indonesian marine engineers need to have competencies of international standards and even must be above international standards. Therefore, an analysis of the competencies of the Indonesian marine engineers is required. It is expected to provide an overview of the advantages possessed by the marine Indonesian engineers in addition to the description of areas that need to get attention for future improvement.

There are hundreds of Indonesian seafarers who did not passed to work for international company due to the level of communication, the level of discipline and the some part of homesick culture. These could be used as the indicators of usage Indonesian seafarers in the international market [12] Long contracts, changing work shifts, permanent influence of physical parameters over 24h per day are only a few examples representing the high psychophysical stress to which seafarers are permanently exposed on board [1-3]. The discrepancy in ship crew position with the competency possessed [4].

Education and training are really required to improve the human resources quality in shipping service. The role of education and training institute is very important to produce national seafarers who have high quality to compete in international market. Recently, Indonesia has sufficient number of seafarers, yet the industry requires the competent seafarer according to the certificate possessed.

Human competency can be known by people who see and assess the activities that he did. A competency appraiser may come from a person who has more knowledge in the field or a superior of the human services user who has the competency. Perception is the work of the brain in understanding and assessing something that happens around it [13]. Furthermore, perception is a process that starts from the utilization of the human senses, from sight, hearing and others to the formation of responses that occur within the individual so that the individual is aware of everything in the environment through the senses he has. The assessment of competency can be done by comparing the characteristics underlying the effectiveness of individual performance (competence) with the required job competence [9]. By using perception, we are able to know whether a person has the competencies required in that position [10].

The expectations reflect individual perceptions of the ability to clearly define goals, to take the initiative and to retain the motivation to use strategies, and to develop specific strategies to achieve those goals [11]. The expextation is something that can be formed and can be used as a step for change. Profitable changes can cause the individual to achieve a better life. Each individual has the ability to form expectations because they have a basic component in the cognitive abilities needed to produce thoughts of hope. Changes related to those expectations require the formation and maintenance of personal power in the context of a supportive or supportive relationship. By comparing perception and expectation, we can know whether there is a gap in achieving a goal. A gap is the difference, imbalance or disparity which is determined to exist between customers' perception of performance and their prior expectation [4,8,9]. Service quality (SQ) perceived by customers is therefore as a result of a comparison of customers' expectation (E) of services that the organization should offer versus their perception of the performance (P) delivered by the service organization.

Service Quality (SQ) = Customer's Perception (P) – Customer's Expectations (E).

Management of service quality largely focuses on managing the gaps between expectations and perceptions of customers [9]. The goal of the firm is to minimize the gap between (P) and (E).

From the problems presented above, researchers are interested to examine the perceptions and expectations of seafarers' competence, especially Indonesian marine engineers. This is very important for policy makers to know which indicators are gaps so that solutions and improvement can be applied. This research is also important for the shipping companies to understand what is the strong factor of Indonesian marine engineers as well as the area which needs to be developed during on board ship.

2. Research method

To start with the method, this research is a quantitative descriptive study using the user approach. The research sample, consisting of 100 respondents, was selected by means of the accidental sampling technique. The respondents were the marine engineers who were identified proper to fill the questionnaire. The data were collected through questionnaires. The analysis used is the Gap Analysis and IPA [2].

The questionnaire survey consists of the several group questions. First is the questions of general information of the respondent. Then, the questions asked respondents to level the degree of perception and expectation of each variable. To extract the level of perception, the respondents were asked to rate each variable on the five–point using Likert scale, varying from “strongly unnecessary” (1) to “strongly necessary” (5). Whereas for the level of expectation, the five – point using Likert scale is used, varying form “strongly unexpected” (1) to “strongly expected” (5).

A questionnaire survey was designed into five competency categories. The first competency category is related to the marine engineering which consists of 7 variables. The second competency category of questionnaire survey consists of 2 variables which related to the electrical, electronic and control engineering. The third competency of the questionnaire survey category consists of 3 variables which related to the maintenance and repair. The fourth competency of questionnaire survey category consists of 8 variables which related to controlling the operation of the ship and care for persons on board. The last competency of the questionnaire survey category is related to the soft skill which consist of 11 variables. The detail of variables is arranged as displayed in the Table 1. Description of variable based on STCW Amendments 2010 [7].

Table 1.

The variables under first until five competency

Var.	Description of Variable	Competency
V1	Shipboard engine operation	Marine engineering
V2	Maintain a safe Engine Room watch	
V3	Understand the characteristics the main engine of diesel, steam turbine and gas, including the- speed, output and fuel-oil consumption.	
V4	Practical knowledge on operation, supervision, performance assessment and security maintenance of the installation of the main engine and auxiliary machineries.	
V5	Respond to emergencies	
V6	Manage fuel oil, lubrication and ballast operation.	
V7	Maneuver the ship	
V8	Operate electrical, electronic and control systems	Electrical, electronic and control engineering
V9	Maintenance and repair of electrical and electronic equipment	
V10	Manage safe and effective maintenance and repair prosedures	
V11	Detect and identify the causes of engine damage and repair it.	Controlling the operation of the ship and care for persons on board
V12	Ensure safe working practices	
V13	Ensure compliance with pollution prevention requirements	
V14	Maintain the seaworthiness of the ship	
V15	Prevent, control and fight fires on board	
V16	Operate life-saving appliances	
V17	Apply medical first aid on board ship	
V18	Monitor compliance with legislative requirements	
V19	Application of leadership and team working skills	Soft skill
V20	Contribute to safety of personnel and ship	
V21	Team work	
V22	Organize and coordinate staff to achieve company objectives	
V23	Continuously learning and wilingness to receive feed back from super ordinate	

V24	Finding problem
V25	Using and acting upon information
V26	Integrity
V27	Motivation
V28	Persistence and courage in facing problem
V29	Leadership pattern
V30	Wise attitude
V31	Responsibility

The survey was conducted at SekolahTinggillmuPelayaran (STIP) Jakarta during September to October 2017. Several manners were used to motivate the questionnaires to the respondents. Nevertheless, to encourage the respondents in participating the survey, face to face and using google form was preferred. Doing so, the response rate increased. Gap analysis is used to determine the steps which are need to be choosen for further improvement from recent condition to the expected condition in the future. The gap analysis is also a means of comparison between actual performance and future performance. This gap analysis also identifies the action plan to achieve the future performance. Furthermore, the gap analysis method is used for analysis between the perception and expectation of Indonesian marine engineers competencies. The gap calculation is acquired from the mean score of expectation after being deducted with mean score of perception. At the end, the gap analysis method is fulfilled for five competency of variables groups.

3. Results and discussion

First of all, the respondent profiles include the respondent's age, education background, competency certificate degree and sea service. For the respondent age, there are 37% have age less than 31 years old, followed by 51% of respondent have middle age between 31–50 years old and small percentage for respondent's age more than 51 years old. Further, regarding to the educational background, there are 7% respondents graduated from senior high school, 33% graduated from diploma, 47% graduated from bachelor, and 7% graduated from master. Then 7% of respondents is categorized with other education background. Based on the competency certificate degree, 40% of respondents were marine engineers class III, 28% of respondents were marine engineers class II, and 26% of respondents were marine engineers class I. In addition, 7% of respondents were categorized with other employment background. It could be concluded that all respondents had experience as the marine engineers on board vessel.

In addition, they have experience as the chief engineer and they have sub ordinate. Their experiences are very helpful for them during filling the questionnaire as they have seen and observed the ability of their marine engineer. As the result, the questionnaire result is more accurate. For the sea service experiences, the 47% respondent has 1 to 3 years experiences. Meanwhile, those who have 4 to 6 years experiences are only 14% respondents accounted and 40% have experienced more than 6 years.

The assessment of marine engineer competency is determined by calculating the level of perception and expectation on each competency group. The result of group 1, marine engineering competencies, is presented in Table 2.

Table 2.

The competency conformity level of group 1

Var.	Mean of Perceptions	Mean of Expectations	Conformity Level	Gap (E – P)
V1	3.42	4.12	83.01 %	0.7
V2	3.34	4.17	80.10 %	0.83
V3	3.08	4.16	74.04 %	1.08
V4	3.29	3.90	84.36 %	0.61
V5	3.30	4.26	77.46 %	0.96
V6	3.36	4.23	79.43 %	0.87
V7	3.16	4.24	74.53 %	1.08

From Table 2, it can be shown that the suitability level of marine engineering competencies for all variables did not achieve 100%. Thus, the expectation of user is higher than the marine engineer competencies currently. Therefore, there is a need to improve this area for future.

Further, the same procedure is applied for the group 2 competency which is electrical, electronic and control engineering as presented in Table 3.

Table 3.

The competency conformity level of group 2

Var.	Mean of Perceptions	Mean of Expectations	Conformity Level	Gap (E – P)
V8	3.04	4.20	72.38 %	1.16
V9	3.33	4.00	83.25 %	0.67

From Table 3, it can be shown that the suitability level of electrical, electronic and control engineering competencies for two variables did not reach 100%. It means that the expectation of user is higher than the marine engineers competencies currently. Therefore, it is necessary to improve this area for future.

The next suitability level measurement is applied for the group 3 competency which is maintenance and repair competency. The result is presented in table 4. It can be shown that the suitability level of maintenance and repair competencies for three variables did not reach 100%.

Table 4.

The competency conformity level of group 3

Var.	Mean of Perceptions	Mean of Expectations	Conformity Level	Gap (E – P)
V10	3.05	4.14	73.67 %	1.09
V11	3.19	4.05	78.77 %	0.86
V12	3.35	4.11	81.51 %	0.76

The conformity level of controlling the operation of the ship and care for persons on board competencies is presented in Table 5.

Table 5.

The competency conformity level of group 4

Var.	Mean of Perceptions	Mean of Expectations	Conformity Level	Gap (E – P)
V13	3.19	4.17	76.50 %	0.98
V14	3.13	4.15	75.42 %	1.02
V15	3.26	4.32	75.46 %	1.06
V16	3.17	4.15	76.39 %	0.98
V17	3.20	4.10	78.05 %	0.90
V18	3.38	4.21	80.29 %	0.83
V19	3.23	4.17	77.46 %	0.94
V20	3.24	4.09	79.22 %	0.85

Table 5 shows that the level of conformity of controlling the operation of the ship and care for persons on board competency for each variable did not meet 100%. The conformity level of soft skill competencies, group 5, is presented in table 6. Table 6 shows that the suitability level of soft skill competencies for each variable did not meet 100%. Thus, the V21, V22, V23, V24, V25, V26, V27, V28, V29, V30 and V31 variables in the soft skill competencies do not meet what the users expected.

Table 6.

The competency conformity level of group 5

Var.	Mean of Perceptions	Mean of Expectations	Conformity Level	Gap (E – P)
V21	3.34	4.01	83.29	0.67
V22	3.06	4.03	75.93	0.97
V23	3.26	4.01	81.30	0.75
V24	3.37	4.01	84.04	0.64

V25	3.26	4.09	79.71	0.83
V26	3.26	4.13	78.93	0.87
V27	3.32	4.05	81.98	0.73
V28	3.3	3.98	82.91	0.68
V29	3.25	4.10	79.27	0.85
V30	3.37	4.16	81.01	0.79
V31	3.34	4.01	83.29	0.67

IPA analysis in this study was conducted on all respondents. Data processing with SPSS 20 obtained images of Cartesian IPA diagram on safety aspect in ship for all respondents as follows:

Based on Figure 1, the competency dimensions of marine engineering for V3 and V7 fall within quadrant I (under action). They are considered important by the respondents however they are not as expected. Their perception values are lower than their expectation.

Then, the competency dimensions of the marine engineer for V1, V2, V5, and V6 fall into Quadrant II (maintain). The perception and expectation level are equally high. This indicates that V1, V2, V5, and V6 are important to the marine engineers who have high performance related to the variables. This condition must be maintained for the future as it is considered very important/ expected as well as the result is very satisfactory.

Next, the competency dimensions of marine engineers for V4 fall in quadrant IV (over act). The position of V4 according to the respondent has a low level of expectation but it has a good performance. Therefore, it is considered excessive by the respondent. This indicates that V4 which influences the user satisfaction of marine engineer competencies is considered too excessive in its implementation.

Based on Figure 2, the competency dimensions of marine engineer for V8 fall in quadrant I (under action). That is, V8 is considered important by the respondents but what they feel is not what they expected. The perception level of V8 is lower than what the respondent expectation. The same procedure is applied for the competency group 3, 4 and 5.

According Figure 3, the competency dimensions of maintenance and repair for V10 fall within quadrant I (under action). They are considered important by the respondents however they are not as expected. Their perception value are lower than their expectation.

Next, the competency dimensions of V11 fall in quadrant III (low priority). This means that V11 is considered less important by the respondent and in fact its performance is not too special. V11 which is contained in quadrant III has low expectation and its performance is also considered unfavourable by the respondent. Increased mastery over V11 needs to be reconsidered. The last competency dimensions of V12 fall in quadrant IV (over act). The position of V12 according to the respondent has a low expectation level but has a good performance, so it is considered excessive by the respondent. This indicates

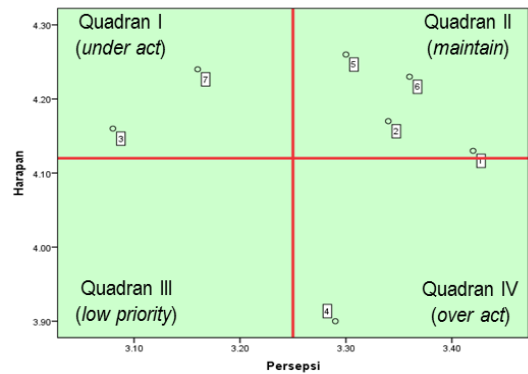


Figure 1: Gap analysis for marine engineering competency

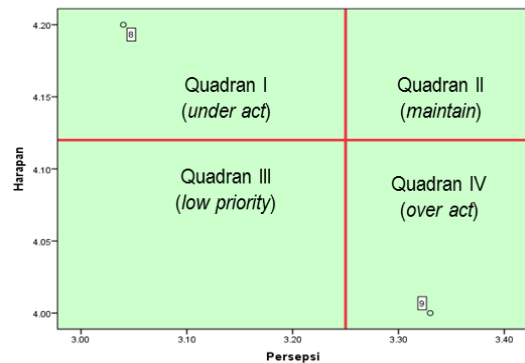


Figure 2. Gap analysis for Electrical, electronic and control engineering competency

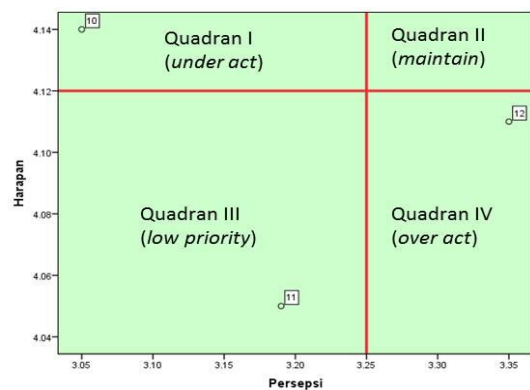


Figure 3: Gap analysis for maintenance and repair

that V12 is considered too excessive in its implementation.

Based on Figure 4, the competency dimensions of controlling the operation of the ship and care for persons on board competency for V13, V14, V16 and V19 fall into quadrant I (under action). They are considered important by respondents but they do not feel as they expect. Next, the competency dimensions of V15 and V18 fall into Quadrant II (Maintain).

Respondents assessed the perception and expectation level of the marine engineer for these variables is equally high. This condition must be maintained for the next time as it is considered expected and the result is very satisfactory. Next, V17 and V20 fall in quadrant III (low priority). V17 and V20 contained in quadrant III have low expectation level and its performance is also considered unfavorable by the respondent. Increased mastery needs to be reconsidered.

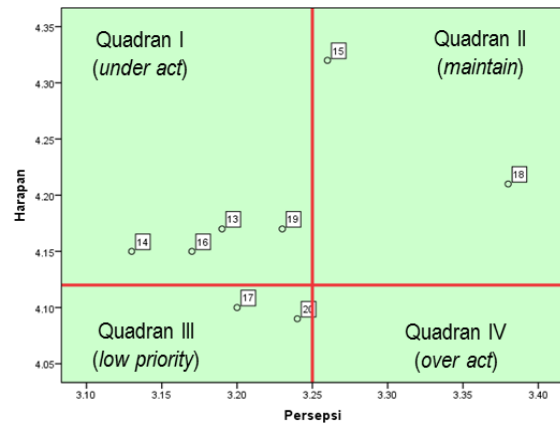


Figure 4. Gap analysis for controlling the operation of the ship and care for persons on board competency

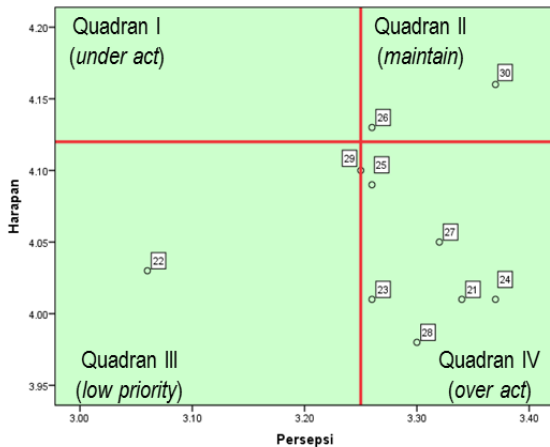


Figure 5: Gap analysis for Soft skill competency

Based on Figure 5, the competency dimensions of soft skill for V26 and V30 fall in Quadrant II (Maintain). Respondents assessed the perception and expectation level of the marine engineer is equally high. This condition must be maintained for the next time as it is considered expected and the result is very satisfactory.

Then, the competency dimensions of V22 fall in quadrant III (low priority). Increasing mastery of V22 needs to be reconsidered. The last is the competency dimensions of V21, V23, V24, V25, V27, V28, and V29 fall in quadrant IV (over act). According to those, the respondent have low expectation but they have good performance.

4. Conclusions

Several things can be concluded in this research. The first relates to gap analysis showing that almost all research variables suggest a gap although relatively small in value. To see the variables that need to be improved, maintained, not priority for improvement or variables that are above expectation then used the IPA model.

First, it can be summarized that there are several variables that need to be improved such as understand the characteristics the main engine of diesel, steam turbine and gas, including the speed, output and fuel-oil consumption (V3), maneuver the ship (V7), operate electrical, electronic and control systems (V8), manage safe and effective maintenance and repair procedures (V10), ensure compliance with pollution prevention requirements (V13), maintain the seaworthiness of the ship (V14), operate life-saving appliances (V16), and application of leadership and team working skills (V19). These variable variables need to get attention for future improvements.

There are several variables that need to be maintained such as : shipboard engine operation (V1), maintain a safe Engine Room watch (V2), respond to emergencies (V5), manage fuel oil, lubrication and ballast operation (V6), prevent, control and fight fires on board (V15), monitor compliance with legislative requirements (V18), integrity (V26), and wise attitude (V30).

Next, there are variables that also need to become attention by the respondents to increase the self-mastery such as: detect and identify the causes of engine damage and repair (V11), apply medical

first aid on board ship (V17), contribute to safety of personnel and ship (V20), organize and coordinate staff to achieve company objectives (V22), and leadership pattern (V29).

Last, variables that are considered excessive in implementation should also get attention. The variables are practical knowledge on operation, supervision, performance assessment and security maintenance of the installation of the main engine and auxiliary machineries (V4), maintenance and repair of electrical and electronic equipment (V9), ensure safe working practices (V12), team work (V21), continuously learning and willingness to receive feedback from super ordinate (V23), finding problem (V24), using and acting upon information (V25), motivation (V27), persistence and courage in facing problem (V28), and responsibility (V31).

The results of this study provide feedback to the marine engineers to further enhance the competence during individual ship work. To support this, a marine engineers may propose the application for training on board or training at a training institution while on vacation. In addition to these training institutions could also use the results of this study to increase the competence areas considered by the marine engineers which are less satisfied. The shipping company may also undertake enhanced training for shipboard engineers on board with ongoing training program

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