Aviation Security Training Design Using Quality Function Deployment

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Abstract:- **The development of the aviation service industry in Indonesia is currently very rapid with the construction of new airports for easier access to connectivity in each region. Aviation security and safety that reaches all flight areas by guaranteeing the protection of aircraft crews and passengers at airports from unlawful actions, by meeting national and international regulatory standards. Aviation Security (Avsec) personnel are human resources (HR) who have these competencies trained from various competitive training institutions. In this paper it is discussed about how to improve the quality of Avsec personnel training institutions with affordable training costs, facilities, and infrastructure to meet and graduates in accordance with industry needs. The method used is Quality Function Deployment (QFD) and House of Quality (HoQ). With result of consumer needs in training plan that provides affordable costs, convenience, utilization of facilities and infrastructure to support learning and the quality of outputs and outcomes is guaranteed. Gradual QFD methods can be able to meet the technical response with affordable training costs, facilities and infrastructure to meet and graduates according to the needs industry.**

Keywords:- Quality Function Deployment, Aviation Security, Training Design.

I. INTRODUCTION

Aviation Security (Avsec) is known since the beginning of the 20th century when the hijacking of aircraft occurred in Peru in 1931. This incident was recorded as the first acts of unlawful interference and then occurred repeatedly to civil aviation. Afterward, Avsec personnel are given the main task to maintain the security and safety of civil aviation in Indonesia to prevent acts of unlawful interference and provide security protection for flight crews, aircraft, passengers, airport installations, ground officers and other flight service users from acts of unlawful interference.

To ensure the competent and professional Avsec Personnel, a qualified Avsec training institution is needed to support the realization of the aviation industry progress. In terms of training industry collaboration, institutional dynamics and institutional logic have an important impact on collaboration between industry and training (Bjerregaard, 2010). There are several studies on collaboration between the aviation industry and training institutions that offer aviation programs (Araujo, 2012).

In the development of professional human resources, especially in aviation sector, to create professional personnel, the training components should be professionally managed as well. In the sense that each preparation of the training components must be directed towards the goals or objectives and integrated without ignoring the effective and efficient principles. Highlighted the need for involvement between training and the aviation industry to improve graduates' employability (Mott, 2014).

Therefore, this study is expected to be able to design the Avsec Training so that it could be tailored to the needs of trainees and stakeholders. The sample data of this study was processed related to validity and reliability. One of the tools to assist in the process of product development and design is Quality Function Deployment (QFD). According to Goetsch & Stanley (2013), QFD is a special method for making needs/ creating important components of design and service. QFD is a concept to provide needs in design and service. Voice of Customer (VoC) is fundamental in QFD and translates it into reality in service. The core of QFD is a series of interrelated matrices known as the House of Quality (HoQ). This can be obtained by identifying VoC, and some comparisons with computing services, determining priority features of new services or improving services. This is a system that guides designers and planners to focus on the service attributes that are most important for users (Homkhiew *et al.*, 2012; Balor, et al, 2017). This involves:

➢ Identify the needs of users known in QFD-speak as Voice of Customer (VoC);
➢ Identify the service attributes that most satisfy VoC;
➢ Set product development and testing targets and priorities that will produce product services that satisfy VoC.

The method of creating a HoQ for service design, including a number of needs, each of which has an interest in the corresponding requirements including obtaining a number of comments about a service; determine, by keyword the processing unit of each requirement, determine at least one requirement related to each requirement and assess the assessment for the requirements based on the requirements (Miao, 2015).

To design effective and sustainable services, therefore, tools for the design process using the QFD approach are used (Marini, 2016). The HoQ used by QFD is a matrix that provides conceptual maps for inter-functional planning and communication. In general, the QFD system is categorized

into four interrelated phases which are product planning, spreading parts, planning process, and production planning phase. The use of QFD has obtained support to assist decision makers in planning and improving services.

Defines QFD is a structured method used in the product planning and development process to establish the specifications and needs, as well as systematic evaluation and the ability of products or services to meet the consumers' needs and desires (Cohen, 1995).

The fundamental problem underlying the provision of aviation security: what the best method to allocate rare resources to reduce the likelihood of a successful attack on civil aviation to an acceptable level is (Gillen, 2015).

II. RESEARCH METHODS

Using Quality Function Deployment (QFD), companies can also connect between customer desires and efforts to improve the quality of products or services (Hadi *et al.*, 2017). This method can also be used to improve the improvement of education services (Wibisono, 2017). The initial step in carrying out the design process is that it is necessary to identify a new idea or market need, until the final step is the complete specification of a product that meets the idea or market need. However, the final step and the next step of the market is needed to ensure that the design process is in accordance with specified.
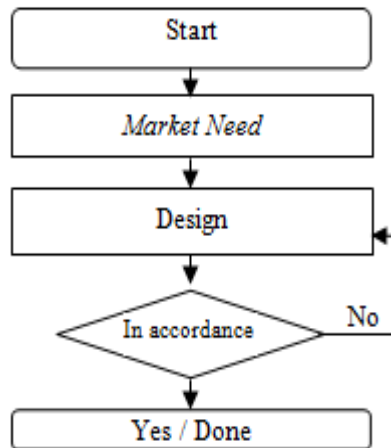
Fig 1:- Flowchart of Avsec Design Using QFD
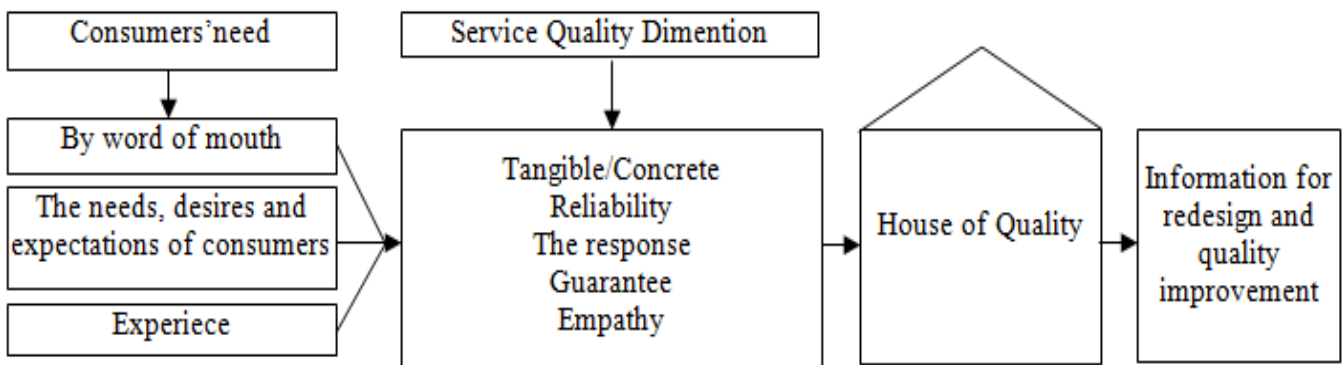
Fig 2:- QFD Model for School Development Plans [9] Tony Wijaya (2011: 51)

Figure 1 shows the flowchart of the research methodology used in the design of AVSEC training. Flowchart shows the algorithm that begins with the identification of needs or in accordance with the needs (market needed). It is followed by the conceptualization that produces a House of Quality (HoQ) matrix. Next it is continuously performed until the detailed stage achieved, so that it is expected that each stage passed can meet the predetermined criteria (market needed) (see Figure 2).

III. RESULTS AND DISCUSSION

QFD is described as a tool for translating VoC into technical terms. There are eight steps. The first step is identifying VoC in terms of identify the desired service needs and after that data collection is carried out. The following is a summary of needs:

➢ Material, CBT and E-learning
➢ Graduation Training
➢ Location and Transportation Access
➢ Price
➢ Certificate
➢ Facilities and infrastructure

- ➢ Training duration
- ➢ Absorption of Graduates
- ➢ On the Job Training

The second step, make a tree diagram to illustrate the problem from the first step. The results can be seen in Figure 3.
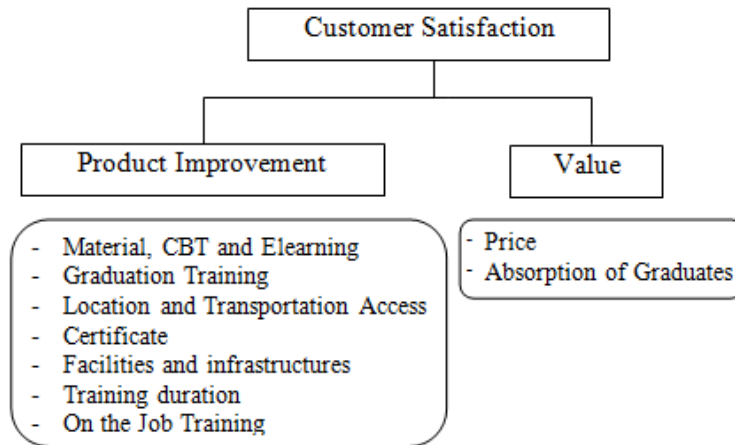
Fig 3:- Tree Diagram for New Product Development

The third step, determine the weighting of needs. This is to determine the need's importance level. The weighting process is determined by team members. The weighting scale is between 1-5 in which 5 is considered as the highest priority. The result is shown in Table 1.

Need assessment	Weight
- Material, CBT and E-learning	3
- Graduation Training	3
- Location and Transportation Access Price	4
- Competency Certificate	5
- Facilities and infrastructure	5
- Training Duration	3
- Absorption of Graduates	3
- On the Job Training	5

Table 1:- Needs and Weighting for Training Design

The fourth step is competitive benchmarks with competitors. The determined competitors are competitors (A) & competitors (B). The result of brainstorming is observing the position of the training service. By using scale of 1-5, the researcher carries out an opinion identification score for each item in the planning matrix. Based on the percentage of total weight, it was decided that the first priority of VoC was the absorption of graduates, low prices, facilities and infrastructure with a range of scores of 15. The second priority was material, CBT and e-learning as well as the duration of training with a score of 13. The results are shown in Figure 4.

Customer Needs	Customer Importances							
Material, CBT dan Elearning	3		3	5	3	5	1,4	1,3	5,5	11
Graduation Training	3		3	5	3	5	1,4	1,3	5,5	11
Location and Transportation Access	2		4	5	3	5	1,2	1,2	2,9	5,7
Price	5		4	2	5	4	1	1,5	7,5	15
Certificate	4		5	3	3	5	1	1,4	5,6	11
Facilities and infrastructures	4		5	5	2	5	1	1,4	5,6	11
Training duration	3		3	5	2	4	1,2	1,3	4,7	9,2
Absorption Ability of Graduates	4		3	3	2	4	1,2	1,4	6,7	13
On the Job Training	5		5	4	4	5	1	1,4	7	14

Fig 4:- Competitors Benchmark

To calculate the improvement factor, it uses the following calculation method:

Improvement factor = ((our planning CS rating – CS rating our product) × 0.2)) + 1

Customer Satisfaction (CS). 0.2 and 1 are constants of the improvement factor formula. To calculate the improvement factor, we referred to the number of our CS planning rankings with number 5 then subtracted by our CS product rank 3 then multiplied by 0.2 the calculation results are then 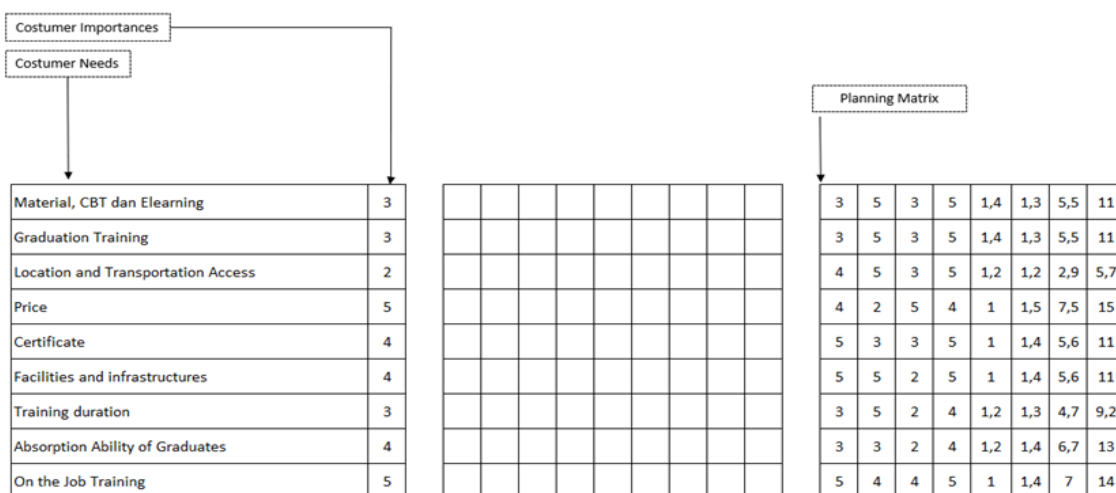added to number 1. the result of the calculation is 1.4. This calculation also applies to the calculation of other items from other specified needs. The detailed calculation method is shown below:

Improvement factor = ((5 - 3) × 0.2) + 1 = 1.4

Using the same case, the calculation of the sales point follows the results of the discussion in the team. The team determines the sales point based on the important points of customer needs for service. Sales points are between 1 and 1.5.

For overall *Weighting* for low prices can be calculated. The equation is as follows.

Overall Weighting = Weight of Customer Importance × Improvement Factor × Sales Point.

Customer interest weights from low prices, scores of 1.4 and 1.5 will be found. In calculating the overall weighting of a low price, the results are as follows.

Overall Weighting= 5 × 1.4 × 1.5 = 10.5
For % *of Total Weight = (Overall Weight/Total Overall Weighting)* × 100

To calculate % of total weight can be seen as follows:

% of *Total Weight* of low prices
= ((10.5/ (9 + 5.5 + 2.9 + 11 + 5.6 + 11 + 9 + 11 + 7)) ×100
= 15

(see row of low prices and column % of total weight)
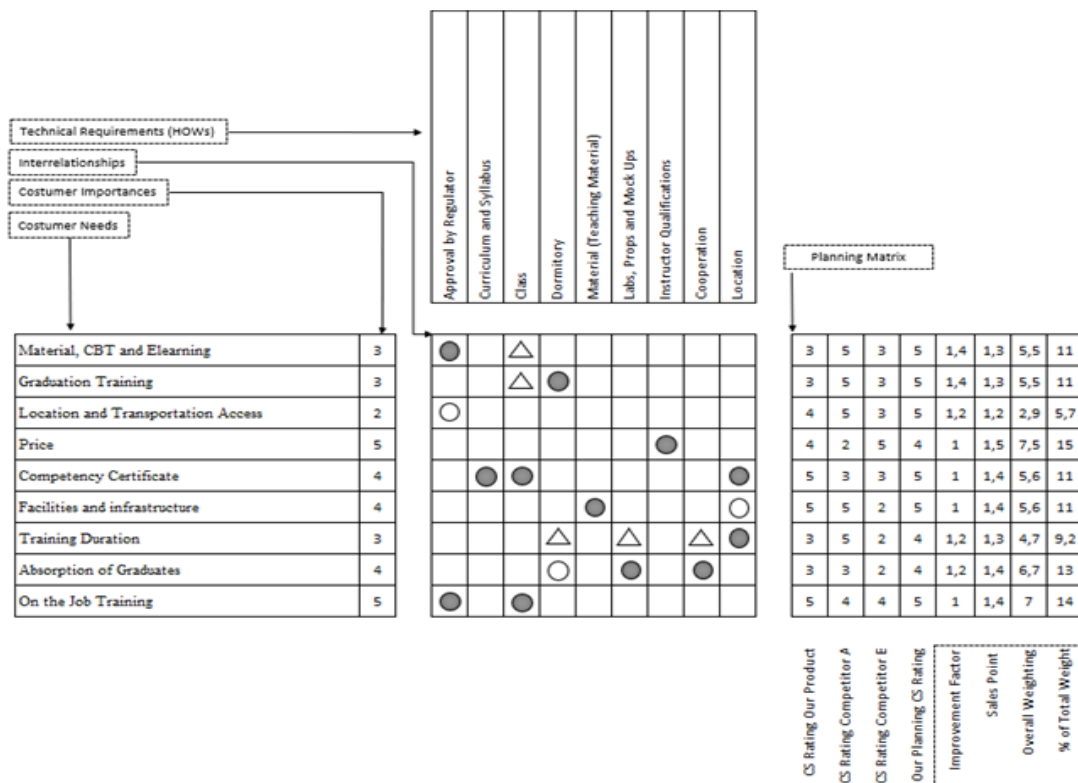
Fig 5:- Technical Requirement (HOW)

The fifth step, technical requirements (HOW) is determining the technical aspects for product specifications to meet customer needs. In this step, the team and researchers identified several technical requirements to achieve customer needs. There are training service fees, teacher fees, maintenance of facilities and infrastructure. The results of the technical requirements (HOW) applied to HoQ are in Figure 5.

The sixth step is the linkage of WHAT and HOW. It identifies how the relationship between customer needs and service requirements. This uses a significance scale of 1, 3 & 9. Scale 1 is the weakest relation, scale 3 is a moderate relation & scale 9 is the strongest relation. In Figure 6, shows that researchers use symbols for visuals to describe the relationship between customer needs and technical requirements and also describe the scores.

Technical Requirements (HOWs)
Interrelationships
Costumer Importances
Costumer Needs

Planning Matrix

Technical Requirements (HOWs): Approval by Regulator, Curriculum and Syllabus, Class, Dormitory, Material (Teaching Material), Labs, Props and Mock Ups, Instructor Qualifications, Cooperation, Location

Costumer Needs	Importance	Planning Matrix							
Material, CBT and Elearning	3	3	5	3	5	1,4	1,3	5,5	11
Graduation Training	3	3	5	3	5	1,4	1,3	5,5	11
Location and Transportation Access	2	4	5	3	5	1,2	1,2	2,9	5,7
Price	5	4	2	5	4	1	1,5	7,5	15
Competency Certificate	4	5	3	3	5	1	1,4	5,6	11
Facilities and infrastructure	4	5	5	2	5	1	1,4	5,6	11
Training Duration	3	3	5	2	4	1,2	1,3	4,7	9,2
Absorption of Graduates	4	3	3	2	4	1,2	1,4	6,7	13
On the Job Training	5	5	4	4	5	1	1,4	7	14

Planning Matrix columns: CS Rating Our Pro, CS Rating Competi, CS Rating Competi, Our Planning CS R, Improvement Fac, Sales Point, Overall Weighting, % of Total Weight

Keterangan :
Interrelationships :
Low = △ = 1
Medium = O = 3
High = ⊛ = 9

Type of Correlation :
+ = Suppprtive
- = Impending

Fig 6:- Interrelationship Matrix

Step seven is creating a HoQ design by selecting a design target (value) from the requirements. The researcher will compare the implementation requirements between training with competitors (A) & competitors (B). This will determine the design target for each requirement whether they are at the same level or more than their competitors.

In Figure 7, shows how to determine the priority of technical needs. In QFD, researchers can double each ranking of technical requirements. There is the weakest relation with a score of 1, a moderate relation with a score of 3, or the highest relationship with a score of 9 from the interrelated matrix with overall weights and number of columns. For the percentage of total priority, researchers can divide the value of individual technical priorities by sum up of all values of technical priorities and multiplying by 100.

IV. CONCLUSION

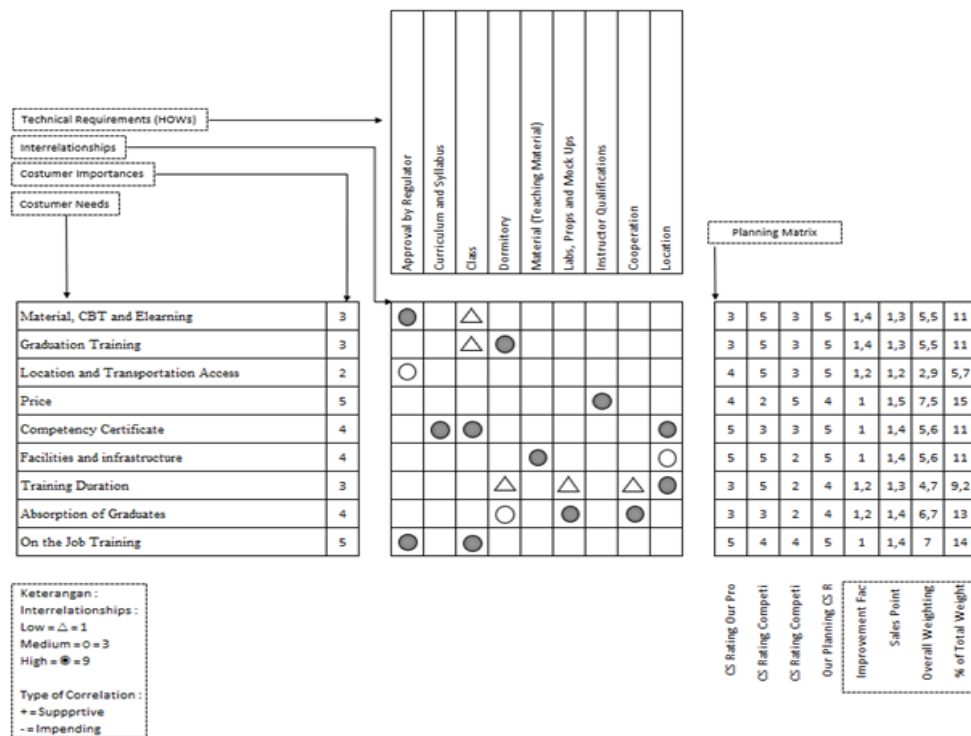The QFD method can be used to determine training service specifications. From the results of the study, the data obtained from the desires of consumers who then followed up with technical requirements, then calculated the comparison of the training itself and competitors. The AVSEC training is to provide knowledge about aviation security standardization and the ability to develop, implement regulations in accordance with guidelines. To achieve this objective, airline operators, airport operators and the government need aviation security personnel. In planning training using the QFD method that focuses on Customer Requirements. Based on the planning results using QFD, the conclusions of this study are: HoQ shows that training participants require training that has operational advantages and good quality. Priority of consumer needs in training plan that provides affordable costs, convenience,

utilization of facilities and infrastructure to support learning and the quality of outputs and outcomes is guaranteed. Gradual QFD methods can be able to meet the technical response with affordable training costs, facilities and infrastructure to meet and graduates according to the needs industry.

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Note :
Interrelationships :
Low = △ = 1
Medium = ○ = 3
High = ⊡ = 9

Type of Correlation :
+ = Suppprtive
- = Impending

- Correlation Matrix HOQ's Roof
- Technical Requirements (HOWs)
- Interrelationships
- Costumer Importances
- Costumer Needs

Planning Matrix

Customer Needs	Importance	Approval by Regulator	Curriculum and Syllabus	Class	Dormitory	Material (Teaching Material)	Labs, Props and Mock Ups	Instructor Qualifications	Cooperation	Location	CS Rating Our Product	CS Rating Competitor A	CS Rating Competitor B	Our Planning CS Rating	Improvement Factor	Sales Point	Overall Weighting	% of Total Weight
Material, CBT and Elearning	3	⊙		△							3	5	3	5	1,4	1,3	5,5	11
Graduation Training	3			△	⊙						3	5	3	5	1,4	1,3	5,5	11
Location and Transportation Access	2	○									4	5	3	5	1,2	1,2	2,9	5,7
Price	5						⊙				4	2	5	4	1	1,5	7,5	15
Competency Certificate	4		⊙	⊙						⊙	5	3	3	5	1	1,4	5,6	11
Facilities and infrastructure	4					⊙				○	5	5	2	5	1	1,4	5,6	11
Training Duration	3			△		△		△		⊙	3	5	2	4	1,2	1,3	4,7	9,2
Absorption of Graduates	4			○		⊙		⊙			3	3	2	4	1,2	1,4	6,7	13
On the Job Training	5	⊙		⊙							5	4	4	5	1	1,4	7	14

Technical Benchmark

		Approval by Regulator	Curriculum and Syllabus	Class	Dormitory	Material	Labs, Props and Mock Ups	Instructor Qualifications	Cooperation	Location
Technical Priorities		121	50	124	74	50	65	68	65	109
% of Total Priorities		17	6,9	17	10	6,9	9	9,3	9	15
Our Product		13jt	Yes	Yes	8	8	7	8	8	8
Competitor A		6,5jt	Yes	Yes	9	8	8	7	8	9
Competitor B		18jt	Yes	Yes	7	8	8	9	7	8
Design Targets		12jt	Yes	Yes	9	9	8	8	8	8

Design Targets Matrix

Formula =
Improvement Factor = ((Planned CS Rating - Existing CS Rating) x 0,2) + 1
Sales Point = number from 1 to 1,5
Overal Weighting = Costumer Importance x Improvement Factor x Sales Point
% of Total Weight = (Overall Weighting / Sum of Overall Weightings) x 100

Formula =
Technical Priorities = (Costumer Importance x Overal Weighting) + …..n
% of Total Priorities = (Technical Priorities / Sum Technical Priorities) x 100

Fig 7:- House of Quality