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# Quality Function Deployment as Product Development Method for Small Medium Enterprise

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**Abstract**

The development of product is paramount particularly for small and medium enterprises (SME) to be leader in the marketplace among competitors. Quality is one of the primary factor for product development and its defined as what customers required. For years, Quality Function Deployment (QFD) has been successfully implemented for large scale industries to ensure the development of product characteristics, specifications and features. The aim of this research is to implement QFD as product development tools in student business unit as a laboratory for enhancing student's ability to be entrepreneur. Secondly, is to testify whether QFD as representative and workable methodology in small industries such as student business unit. This research was conducted student business unit in Agro-industrial Technology Department, University of Darussalam Gontor as the producer of yogurt to be analyzed for its characteristics. This paper discusses two phases of relationships matrix between voice of customer and technical responses. Conducting survey with questionnaires is needed to figure out primary customer attributes. Furthermore, identification of key process operations by focus group discussion with management is conducted. This writing discovered taste of yogurt and package design are become the foremost attributes to be improved as customer's need priorities. Eventually, this study is considered to bring QFD in SMEs as product design tool for yielding competitive products and better marketing strategy.

*Keywords:* Product Design, Quality Function Deployment, small medium enterprises, Yogurt

## Introduction

Nowadays, industrial competitiveness is getting tougher regarding development of technology, innovation and economy. The significance of quality has successfully dominated as the main business activity such as statistical quality control, total quality management and continuous improvement. In addition, innovation plays important factor to enhance market share by fulfillment the need of customers through product characteristics. Both large scale manufacturers and small-medium scale enterprises are obligate to satisfy about what customer need, want and looking for. The enterprises/manufacturers must have a process for innovating of production

process, customer driven oriented and new product development. For instance, Miguel (2007) [1] has reported the strong relationship between Quality Function Deployment (QFD) and innovation in some new product development are considerably made. However, innovation is a term for both large scale industries and small medium industries.

On the other hand, small and medium enterprises are growing rapidly in Indonesia both in production capacity and the amount of enterprises. Their problems are quite similar to larger company which is competitiveness. Many scholars have studied implementation of *quality function deployment* for manufacturers and services in large scale industries. Universitas Darussalam (UNIDA) Gontor as

emerging higher institution is obligate to produce competent graduates, by integrating Islamic values and science. Agro-Industrial Technology Study Program, UNIDA Gontor (TIP UNIDA Gontor) has a mission to yield graduates who's able to be Moslem technopreneur. In order to gain the goal of the university, Agro-industrial Technology Department has established *Agro-industrial Tech. Corporation* with main activity to motivate, embrace and learn student to create some innovative agricultural products. This student business unit is a small enterprise which is yogurt is the main product namely *YoFresh*.

Quality function deployment (QFD) method builds a parameter relationship between consumer desires and product characteristics designed by the company. This research aims to identify the characteristics of yogurt according to consumers to the characteristics of yogurt according to the manufacturer. The characteristics refer to quality, design and others. What consumers need will be distributed through house of quality (HoQ) analysis, as the most important matrix in QFD. This research begins with identifying consumer needs for YoFresh yogurt products. Furthermore, determining the product design specifications and characteristics of the production process. After the two stages are carried out, the relationship between the two matrix of HoQ and Technical Responses (TR) needs to be done by giving an assessment of how much the TR accommodates the needs of consumers. This can be applied in supporting students in creating innovative products, so that students' insight into moslem technopreneur will increase.

## Qualify Function Deployment

The origins of quality function deployment (QFD) was from Japan, during the late of 1960s. During resurrection after Second World War, Japan was turned from copying and imitating product into a product developer based on originality. It was encouraging Japan manufacturers to preserve quality from the early process of production. Shortly, QFD was born as product development concept or method, a part of Total Quality Management approach as topic in *Quality Function Deployment* book written by Shigeru Mizuno and Yoji Akao in 1978. Similarly, QFD played important role in statistical quality control (SQC) to assure the quality of product manufacture in particular [2]. In addition, in 1954 Dr. J. M. Juran, a very notable quality management consultant attracted the *Japanese Union of Scientists and Engineers* (JUSE) to invite him in order to teach about managing for quality and the essential of quality control in business. Japan manufacturers were striving to implement quality control as the main activity by utilizing statistical methods.

Quality Function Deployment (QFD) has emerged among Just In Time manufacturing to meet customer requirement for last decade which has gained in advanced quality planning, dominated by voice of customer [2]. QFD has two dominant models, the first is American Supplier Institute (ASI) model and the second is Akao's matrix of Matrices model [3]. With the potential of QFD methodology and applied to Lean manufacturing, there will be a new methodology for eliminating waste, within adding some statistical quality control tools, such as Ishikawa diagram. The main part of QFD is house of quality, a graphical matrix encompass six major matrixes as depicted in Figure 1: voice of customer, technical responses, relationship, benchmarking, correlation and technical assessment. These matrixes can depict broadly and clearly the interrelationships between various elements and identify the benchmarking with competitors which have similar core business. QFD is analyzed by a cross-functional team, as a horizontal concept stretches across the functional organization. QFD team should be communicated intensively with stakeholders in which representative of industries, customer and management in order to gain information that needed.
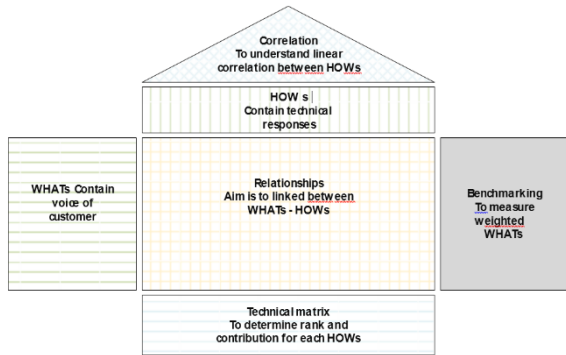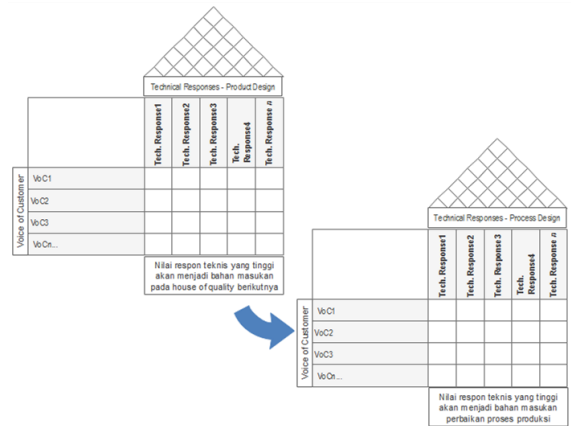
Fig. 1. conceptual matrixes of QFD

The quality literature during 1980s may have been dominated by manufacturing applications. But the more complex of service organizations and their functions are being observed to enhance their management capability in quality improvement. Quality management provides a connection between outcomes and the process by which outcomes are achieved. Concomitant with the TQM approach to management, higher education institutions particularly in USA have been observed whether education can be managed and improve to their alumnus. Many scholars had written QFD application in service organization. For instance, three phases of QFD was designed involving the integration of learning outcomes (LO), graduate abilities (GA), core competencies (CC), and department courses to In order to encourage competencies, outcomes and abilities into college student [5].

**Research Methodology**

The phase of QFD in this study designed two interrelated HoQ models. HoQ - 1 produces technical matrix values which will be analyzed later in HoQ - 2. The last output of HoQ is to evaluate the production process at Yo Fresh business units. Each HoQ phase is carried out according to the flow chart above with each different outcome. Figure 2 give illustration about the relationship between those phases.



Fig. 2. Connecting of two phases QFD

Figure 2 accommodates customer need into producing *Standard Operating Procedure* (SOP) to improve production process of YoFresh. The research commenced by focus group discussion with the management of Agro-industrial Tech. Corporation as mentioned before to figure out the characteristics of YoFresh. Designing questionnaire is needed to collect the perceptions of YoFresh customers. Table 1 explain the characteristics and contain with several *attributes*.

Table 1. The classification of Attributes

| Characteristics | Attributes |
|---|---|
| *Durability* | YoFresh durability |
| *Package Design* | Official logo of Halal availability |
| | Sealed and air-tight |
| | Nutrition fact label |
| | Product composition label |
| | Words of Wisdom |
| | Attractive package |
| *Outlet Availability* | *YoFresh outlet is available at every dormitory* |
| *Brand* | Easy to remember |
| *Price* | Affordable price |
| *Taste* | Variation of taste |
| | Customer loyalty |

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## Production Process

YoFresh's production process needs to be identified as input material in analyzing technical responses that are used to find the value of relationships with the voice of the customer. This means that how far the production process of YoFresh can create products that are in accordance with VoC as shown in Figure 3.
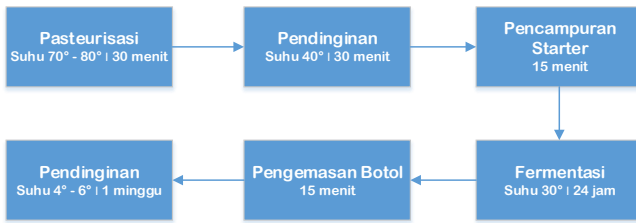


Fig. 3. Production Process

## Determining Voice of Customer

Voice of Customer is obtained from the identification of attributes distributed into the questionnaire and the respondent provides an assessment of each attribute. The assessment is in the form of weighting with a range of 1, 3, 5, 7 and 9. The higher weight indicates that these attributes are important for analysis. Table 2 shows the weighting rating model for each attributes.

## Reliability and Validity Analysis

Validity indicates the extent to which the score / value / size obtained actually states the measured / observed results. Validity analysis uses the Pearson Product Moment formula with the results is shown in table 3. Every attributes are higher than $r$ table with = 0.335 35 respondents as preliminary survey. The purpose of preliminary survey is to figure out whether the questionnaire is valid and reliable.

Table 2. The Attributes Scores and Weight

| Symbol | Attributes | Weighted | Amount | % |
|--------|-----------|----------|--------|---|
| A4 | Product composition label | 7.90 | 790 | 10.334% |
| A6 | Attractive package | 7.70 | 770 | 10.072% |
| A5 | Words of Wisdom | 7.28 | 728 | 9.523% |
| A8 | Easy to remember | 7.12 | 712 | 9.313% |
| A10 | Variation of taste | 7.08 | 708 | 9.261% |
| A1 | YoFresh durability | 7.02 | 695 | 9.091% |
| A9 | Affordable price | 6.82 | 682 | 8.921% |
| A3 | Nutrition fact label | 6.74 | 674 | 8.816% |
| A11 | Customer loyalty | 6.62 | 662 | 8.659% |
| A7 | *YoFresh outlet is available at every dormitory* | 6.54 | 654 | 8.555% |
| A2 | Official logo of Halal availability | 5.82 | 570 | 7.456% |
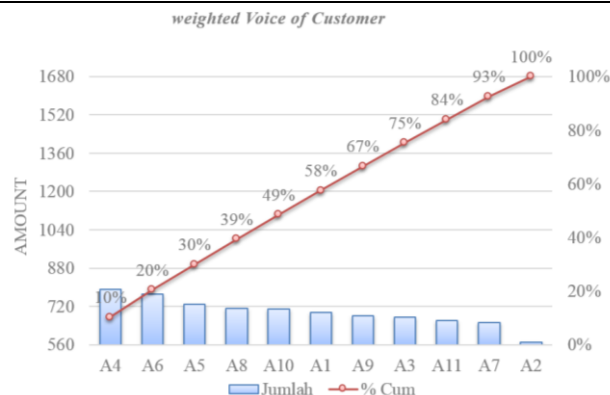
Table 3. The Attributes Scores of validity

| No. | Attributes | $r_{scores}$ |
|-----|-----------|--------------|
| A1 | YoFresh durability | 0.697 |
| A2 | Official logo of Halal availability | 0.725 |
| A3 | Sealed and air-tight | 0.492 |
| A4 | Nutrition fact label | 0.634 |
| A5 | Product composition label | 0.666 |
| A6 | Words of Wisdom | 0.521 |
| A7 | Attractive package | 0.683 |
| A8 | YoFresh outlet is available at every dormitory | 0.539 |
| A9 | Easy to remember | 0.613 |
| A10 | Affordable price | 0.672 |
| A11 | Variation of taste | 0.619 |
| A12 | Customer loyalty | 0.630 |

## Conclusions

The UNIDA Gontor TIP study unit was formed to provide knowledge and insight to students in entrepreneurship. This study was designed to apply quality function deployment (QFD) as a method in distributing what consumers want to the characteristics of Yo Fresh products. This study also aims to improve the production process as a result of increasing the quality characteristics of yogurt. With continuous improvement it will produce product innovations supported by optimal marketing, attractive packaging design, efficient production processes. With the implementation of quality function deployment, we can identify the main elements of Yo Fresh products, Yo Fresh characteristics, relationships between elements and characteristics and competitiveness levels with other brands.

## Acknowledgements

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