Extending the Eight Dimensions of Quality

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Abstract

Eight dimensions of quality suggested by Garvin are well-known. It can serve as a framework for strategic analysis to obtain leverage of quality in a competitive market. However, some practically important dimensions such as usability, cost, etc. are not included in the Garvin's. Based on a survey of newly introduced products, we suggest another framework for dimensions of quality: function, time, limitation, usability, problem prevention, economy, maintainability, nativeness. These dimensions are explained with examles.

1. Introduction

Managers often claim that they cannot know how their product quality stacks up against those of their competitors, who may well have chosen an entirely different quality mix. Japanese automobile manufacturers have gained a substantial market share in the United States largely because of consumer perception that their products are of high quality. The quality superiority of Japanese cars have been principally in fit and finish, which reduced warranty work significantly. In other quality dimensions such as safety, durability, and corrosion resistance, U.S. manufacturers have maintained superiority.

The fact that a product is simply the result of an advanced technology does not alone assure its success. Thus, it is necessary to identify the strategically important quality attributes and leverage them as a main source of competitive advantage.

2. Previous Studies on Quality Dimensions

Traditionally, quality has been considered in such a way that it reduces failures or eliminates defects. However, it cannot be overemphasized that high quality means delighting customers, not just preventing complaints or claims from them.

Gavin(1987) proposed eight dimensions of quality that can serve as a framework for strategic analysis. A product or service can rank high on one dimension of quality and low on another - indeed, an improvement in one may be achieved only at the expense of another. Therefore the challenge to managers is to compete on the selected dimensions. The followings are the eight dimensions of quality suggested by Gavin(1987).

Performance: Performance refers to a product's primary operating characteristics. For an automobile, performance would include traits like acceleration, handling, cruising speed, and comfort; for a television set, performance means sound and picture clarity, color, and the ability to receive distance stations.

Features: Similar thinking can be applied to features, a second dimensions of quality that is often a secondary aspect of performance. Features supplement their basic functioning. Examples include free drinks on a plane, and automatic tuners on a color television set.

Reliability: This dimension reflects the probability of a product malfunctioning or failing within a specified time period. Among the most common measures of reliability are the mean time to first failure, the mean time between failures(MTBF), and the failure rate per unit time.

Conformance: A related dimension of quality in conformance, or the degree to which a product's design and operating characteristics meet established standards. All products and services involve specifications of some sort.

Durability: A measure of product life, durability has both economic and technical dimensions. Technically, durability can be defined as the amount of use one gets from a product before it deteriorates. Durability may be defined as the amount of use one gets from product before it breaks down and replacement is preferable to continued repair.

Serviceability: A sixth dimension of quality is serviceability, or the speed, courtesy, competence, and ease of repair. Consumers are concerned not only about a product breaking down but also the time before service is restored, the timeliness with which service appointments are kept, the nature of dealings with service personnel, and the frequency with which service calls or repairs fail to correct troubles.

Aesthetics: The final two dimensions of quality are the most subjective. Aesthetics - how a product looks, feels, sounds, tastes, or smells - is clearly a matter of personal judgement and a reflection of individual preference. Nevertheless, there appear to be some patterns in consumers' rankings of products on the basis of taste. On this dimension of quality, it is impossible to please everyone. Companies therefore have to search for a niche.

Perceived Quality: Consumers do not always have complete information about a product's or service's attributes; indirect measures may be their only basis for comparing brands. In certain circumstances, images, advertising, and brand names - inferences about quality rather than the reality itself - can be crucial. For this reason, both Honda - which makes cars in Marysville, Ohio; and Sony - which builds color televisions in San Diego - have been reluctant to publicize that their products are "made in America." Reputation has the primary role of perceived quality.

A company need not to pursue all eight dimensions simultaneously. In fact, that is seldom possible unless it intends to charge unreasonably high prices. Technological limitations may impose a further constraint. In some cases, a product or service can be improved in one dimension of quality only if it becomes worse in another

Other authors suggested quality dimensions. Muramatsu et. al.(1990) presented the fundamental elements of product characteristics: specification/efficiency, reliability, safety, maintainability, ease of operation, transportation, feeling, guarantee, price/manufacturing cost, total life-cycle cost, others.

In spite of the fact that industrial product appearance does not bear upon performance in many researches, Yamamoto & Lambert(1994) provide evidence that pleasing aesthetics may have an impact upon product evaluation. This does not brush aside performance or price concerns, but suggests that aesthetically pleasing properties appear to have a positive influence upon preference. This suggests that attention paid to product aesthetics may have a payoff in terms of sales performance. In a crowded marketplace faced with increasing standardization, attention paid to industrial design could be a key to enhanced sales performance

3. Extending the Eight Dimensions of Quality

In order to leverage quality attributes in a strategic point of view, the eight dimensions should be further developed in detail. Based on the survey of newly introduced 892 products, we suggest another framework for dimensions of quality as summarized in Table 1.

<Table 1> Quality dimensions and elements

Dimensions	Elements
Function	Basic core function, Supportive function, Additional function, Hybrid function
Time	Warming-up/waiting time, Function completion time, Continuously usable time.
Limitation	Objects/coverage limitation, Supplies limitation, Users limitation, Location limitation, Circumstances limitation, Space limitation
Usability	Ease of use, Simultaneously multi-functioning, Portability
Problem prevention	Fool-proof, Harmlessness
Economy	Life-time, Life-cycle cost, Module upgrade
Maintainability	Ease of parts/supplies replacement, Ease of maintenance
Nativeness	Nature, Emotionality, Privacy

(1) Function

'Function' is composed of four components: basic core function, supportive function, additional function, hybrid function.

'Basic core function' denotes basic operating characteristics of a product. For an automobile, it includes traits like acceleration, cruising speed; for a television set, sound and picture clarity, color.

'Supportive function' performs auxiliary functions that supplement basic core function. It is a secondary aspect of basic core function. The AT&T VideoPhone 2500, with a 3.3 inch diagonal LCD screen, lets user see whom he is talking to. Without this screen, user has no difficulty in communication. But using this screen, he could call more effectively and pleasantly.

'Additional function' is another one added to basic core function. In this case, basic core function is the main characteristic, and additional function becomes other useful subfunction. In the standpoint of customers, basic core function is the primary reason for the purchase. The air-conditioner with air-cleaning function is an example of a

product with additional function.

In the case of a product that has hybrid functions, it is difficult to discriminate main function from subfunctions. The G5 by Omnifax, which has those functions of fax machine, copier, printer and scanner, is an example.

(2) Time

This dimension is composed of three components: warming-up/waiting time, function completion time, continuously usable time.

'Warming-up/waiting time' refers to a kind of set-up time. Some examples are booting time of a computer, preheating time of a heater, etc.

'Function completion time' denotes the time-length required to complete the required mission. Microwave whistling tea-kettle by General Housewares boils a quart of water in just 6.5 minutes about 15% faster than in a regular tea-kettle on an electric range.

'Continuously usable time' means the maximum length of up-time without recharging, stoppage, or any other interruptions. For portable products such as cellular phone and notebook computer, this element would be especially important. The Toshiba *Portégé* notebook computer uses the rechargeable lithium-ion battery, previously used in camcorders, which gives 50% more life than nickel metal hybrid batteries for the same weight and 75% more than nickel cadmium batteries.

(3) Limitation

This dimension is composed of six components: objects/coverage limitation, supplies limitation, users limitation, location limitation, circumstances limitation, space limitation. Loosening these limitations would be significant merits to customers.

'Objects/coverage limitation' means that the use of a product is restricted by the size, material, or component parts with which a product deals. The WideFax by WideCom Group which can transmit blue-prints and engineering drawings is one example, and the washing machine which can launder woolen cloth would be another example of loosening this limitation.

'Supplies limitation' refers to the case that a product must use the pre-specified supplies. Fax machine which can receive messages with ordinary paper is a case of loosening this limitation.

'User limitation' means the situation that a portion of latent users such as the handicapped, the aged, or children cannot use. IBM introduced a new PC-based Phone Communicator system which helps the deaf talk to others without the aid of operators or special equipment on both ends of the line.

'Location limitation' refers to the case that a product can be used only within a fixed, installed area. The products such as notebook computer and cellular phone are the ones which remove the limitation.

'Circumstances limitation' denotes that a product's use is restricted by environmental

conditions such as humidity, temperature, or illumination, etc. The Bell Atlantic's BAH 20, a water-resistant cordless phone whose handset's body, earpiece, and microphone are sealed, can be used in the pool or in the bath. This product reduces that kind of limitation.

'Space limitation' denotes that product's occupying space is so bulky that customers have a great difficulty to keep it.

(4) Usability

This dimension refers to the characteristics which makes the use of available functions more easy. It is composed of three elements: ease of use, simultaneously multi-functioning, portability.

'Ease of use' means that operating procedure is simplified, shortened, or remotely -controlled, so it relieves physical, intellectual, or psychological loads of the user.

Simultaneously multi-functioning means that multiple functions of a product can be performed simultaneously. Printing a fax while scanning a document into PC would be an example.

Portability refers to the characteristics how small, compact, and light a product is so as to carry and keep it conveniently. The Sony CCD-TR51 camcorder has a less bulky shape. It is smaller than any other camcoders before- just over six inches long, weighing about 1.3 pounds without tape or battery.

(5) Problem prevention

This dimension means that a product has no harmful effects and potential safety problems, and it is divided into two elements: fool-proof and harmlessness.

Fool-proof means that when the user of a product makes any mistake in course of use, the product senses the mistake and stops its operation automatically to prevent any other subsequent accidents or damages to be resulted from the mistake. Fool-proof is often called as mistake-proof.

'Harmlessness' describes that a product doesn't bear any inherent harmful effects to the user or the society such as air-pollution of a gasoline car, electromagnetic waves of an electronic product.

(6) Economy

This dimension includes life-time, life-cycle cost, module upgrade.

Sylvania's Soft White Compact Fluorescent bulb is an example which lengthened its life-time significantly. Although the price is quite expensive, $20 per bulb, it lasts 13 times longer than incandescent lamps and consumes far less energy, user could save $57 over the 10,000-hour average life of the bulb.

'Life-cycle cost', which includes purchasing price, operation and maintenance costs, and disposal cost, is another important element. Motorola, which dominates the beeper/pager market, introduced a new version of its alphanumeric pager to sell much

cheaper than its previous top-line models.

'Module upgrade' means that it is possible to upgrade a product by replacing any part of the product with a updated module. It is not unusual to the users of personal computers.

(7) Maintainability

This dimension includes ease of part replacement and maintenance.

APS camera designed to replace film easily, printer and copier designed to substitute toner easily are examples of 'ease of part replacement.'

'Ease of maintenance' refers to the characteristics which make it easier to keep or maintain a product. Braun's Flex Control shaver which notifies recharging time, Brother International's laser printer which reduces the chance of paper jams by sending paper through a nearly straight path rather than winding around rollers as in the usual way, and copier which extracts a jammed paper automatically just by pushing a button are the cases.

(8) Nativeness

This dimension can be divided into three elements: nature, emotionality, privacy.

'Nature' emphasizes purity or freshness of a product. Mountaintop's Attakiska vodka produced using glacier water is an example.

'Emotionality' is the element related to aesthetics, image, feeling of a product. Aerodynamic design of Taurus and distinctive oval headlights of Neon are some of the examples.

'Privacy' means that users' privacy or secrecy is safely kept from others. The *Trópez* 900DX phone by VTECH Communications prevents from wire tapping, and the Privacy Filter by 3M fits over computer screen, shielding work from people on either side. So the user seated in front of the computer can see the screen cleary through the filter, but the entire screen looks like a dark black panel to other people at off-axis (more than 30 degrees to either side).

4. Concluding Remarks

Understanding the dimensions of quality is especially important in order to explore the opportunities distinguishing its own products from another company's products. Although dimensions of quality suggested by Garvin are well-known, we have found that the framework omitted some practically important dimensions such as usability, limitation, economy, etc. Based on the survey of newly introduced 892 products, we suggest another framework for dimensions of quality. The suggested dimensions of quality can serve as a framework for strategic analysis to obtain leverage of quality in competitive global market.

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