Market-driven product and service design: Bridging the gap between customer needs, quality management, and customer satisfaction

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Abstract

Bridging the gap between a firm’s internal quality improvements and external measures of customer needs and satisfaction is an important yet complex translation process. The process has traditionally been studied within two very different domains. An external focus on customers has been the domain of marketers. Manufacturing and engineering-based approaches to quality management and improvement have traditionally taken a more internal, process improvement focus. Both areas have recognized the need to broaden their focus and bridge the gap between internal quality and external customers needs and satisfaction. This paper offers a framework to integrate these two domains. A case study is presented to demonstrate the usefulness of an integrated approach. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

The significance of product and service quality as a major competitive success factor is undisputed. There is no alternative to hard-fought buyers’ markets made up of critical, demanding customers to consistent quality orientation. Recently, however, the design of product quality has come to be seen not merely as the task of a single functional unit, but as a central challenge for any company. This altered perspective was brought about by the realization that superior products are available in many branches of industry, in terms of both price/cost and quality. This was accompanied by the recognition that the outstanding performance of Japanese manufacturers in particular cannot be entirely attributed to a higher, culturally founded level of employee commitment combined with a lower level of the quality function deployment concept (QFD) — which embraces all operational functions that is responsible for their market success [1,2].

QFD can be described as an approach to product quality design, which attempts to translate the voice of the customer into the language of the engineer. The customer’s wants are often called the “whats”, or what QFD is ultimately supposed to improve [3,4]. Furthermore it is necessary to determine the “hows” or the design requirements that will determine how the “whats” are to be fulfilled. The design requirements should be expressed by
in measurable terms (such as the amount of pressure required to close a door system from the outside). The core principle of this concept is a systematic transformation of customer requirements and expectations into measurable product and process parameters. From the methodical point of view, it would appear useful to subdivide a quality planning process derived from customers' expressed wishes into four separate phases [5,6].

The House of Quality, which represents the first phase of the QFD concept, is concerned with translating the purchase-decision-relevant attributes of a product that have been established [7–9], for example, within the framework of a conjoint study into design features (see Fig. 1). It is important to point out that these design requirements are not design solutions, which do not appear until the second house (part deployment). These design features are subsequently transformed into part features during the parts development phase. The aim of the work preparation phase is then to define crucial operating procedures on the basis of the specified part features. The crucial operating procedures in turn serve to determine the production requirements in greater detail [10].

This approach suggests that the attributes of a product are crucial to a consumer's assessment of its usefulness [11]. However, it is not only the intrinsic (physical, chemical or technical) product attributes that determine the quality judgement [12, in particular pp. 222–232]. On the contrary, the value attached to a product is dependent on extrinsic (immaterial or non-functional) attributes, such as the brand name and aesthetic aspects. Table 1 gives some examples for extrinsic and intrinsic attributes of a car door. Moreover, behavioural science studies have documented that the perception of product attributes by consumers — which is not necessarily identical to objective reality — controls purchasing patterns. The (perceived) attributes thus represent the most suitable determinants for conceiving marketing activities [13].

In addition, it seems reasonable to state that consumers do not consider a product (e.g. a car) as a package of attributes (e.g. quality of tires, miles per gallon, engine size), but rather as a complex of
Table 1
Extrinsic and intrinsic attributes of a car door

<table>
<thead>
<tr>
<th>Extrinsic attributes of a car door</th>
<th>Intrinsic attributes of a car door</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good operation and use</td>
<td>Good appearance</td>
</tr>
<tr>
<td>Easy to close from outside</td>
<td>Interior material will not fade</td>
</tr>
<tr>
<td>Stays open on hill</td>
<td>Attractive, nonplastic look</td>
</tr>
<tr>
<td>Easy to open from outside</td>
<td>Easy to clean</td>
</tr>
<tr>
<td>Does not kick back</td>
<td>No grease from door</td>
</tr>
<tr>
<td>Easy to close from inside</td>
<td>Uniform gaps between matching panels</td>
</tr>
<tr>
<td>Easy to open from inside</td>
<td></td>
</tr>
<tr>
<td>Does not leak rain</td>
<td></td>
</tr>
<tr>
<td>No road noise</td>
<td></td>
</tr>
<tr>
<td>Does not leak in car wash</td>
<td></td>
</tr>
<tr>
<td>No wind noise</td>
<td></td>
</tr>
<tr>
<td>Does not drip water or snow when open</td>
<td></td>
</tr>
<tr>
<td>Does not rattle</td>
<td></td>
</tr>
<tr>
<td>Soft, comfortable arm rest</td>
<td></td>
</tr>
<tr>
<td>Arm rest in right position</td>
<td></td>
</tr>
</tbody>
</table>

Table 2
Attributes and benefit components of a car

<table>
<thead>
<tr>
<th>Benefit components of a car</th>
<th>Attributes of a car</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class membership</td>
<td>Airbag</td>
</tr>
<tr>
<td>Additional prestige</td>
<td>Sport chassis</td>
</tr>
<tr>
<td>Quick reactions</td>
<td>Engine power</td>
</tr>
<tr>
<td>Performance</td>
<td>Convenience of control</td>
</tr>
<tr>
<td>Relaxation</td>
<td>Sport seats</td>
</tr>
<tr>
<td>Impressing others</td>
<td>Hifi system</td>
</tr>
<tr>
<td>Well-being</td>
<td>Body shape</td>
</tr>
<tr>
<td>Aesthetics of design</td>
<td>Bumper same colour as the car</td>
</tr>
</tbody>
</table>

utility (benefit) components [14,15]. The benefit components of a product (e.g. a car) reflect its ability to fulfill customers’ needs, such as demonstrating class membership, conveying prestige, impressing others, enjoying safety. The intrinsic and extrinsic attributes describe the material and immaterial characteristics of a product, whereas the utility components denote its usefulness for problem solving (see Table 2) [5]. This idea appears plausible, as buyers are only rarely aware of all the beneficial attributes of a product. In many cases it is also true to say that different attributes provide a concrete utility and that one attribute can affect different utility areas. Nevertheless, there is not normally a “one-to-one” relationship between the features and the utility components. This supposition illustrates one of the dilemmas of marketing policy: when a company develops a product, it is only able to decide the levels of this product’s intrinsic attributes. A consumer, on the other hand, bases his or her purchase decision on the utility conceptions derived from a perception of the product’s attributes.

There is, however, cause to doubt that the utility expectations of the buyer do in fact constitute the ultimate explanation of purchasing behaviour. On the contrary, the motives for individual actions can be better accounted for by stimulating forces, such as a set of values and the formation of an intention [16–18]). Nevertheless, very little attention is paid to these hypothetical constructs when specifying a product’s performance. There are two reasons for this: firstly, numerous studies have documented the unsatisfactory association between these variables and purchasing behaviour. It is an undisputed fact that specific behavioural patterns cannot be predicted, for example, on the basis of specific motives [19]. Secondly, there is no theory in existence at the present time which describes the interaction between the hypothetical constructs and the relevant utility components and product attributes. Consequently, no evidence is available to support the notion that marketing activities are conceived according to the stimulating forces of purchasing behaviour. We contend that the various problems which are raised in this connection can be solved by extending the quality function deployment approach from the point of view of marketing theory (see Fig. 2).

First of all, the means–end theory is used to integrate the set of values of a consumer with the utility components or the attributes of a product. Those attributes which are relevant to purchasing behaviour can then be transformed into design features and part features, as well as operating procedures and production requirements with the aid of the “traditional” quality function deployment approach. Finally, an analysis of customer satisfaction provides information regarding the extent to which the product, which has been
developed on the basis of the extended quality function deployment concept, corresponds to the consumer’s utility expectations and to his set of values.

2. An extension of the quality function deployment approach

2.1. Means–end theory

The means–end theory is based on work carried out by Tolman. He first drew attention to the goal-oriented nature of individual behavior as early as the 1930s. The fundamental idea behind this approach is explained by Kroeber-Riel and Weinberg as follows: “...the motivation to purchase a product is derived from the consumer’s perception of it as a suitable means for generating pleasant feelings and for gratifying desires...” [20, p. 142]. The suggestion is that — within the framework of an information-processing process — an individual forms a conception of the suitability of the product in question (means) for fulfilling a specific want (end). At the same time, the supplier attempts to set this cognitive process in motion and to influence it to his own advantage. In particular, he tries to guide the buyer’s stimulating forces towards a particular product and to trigger a purchase motivation [21,22].

During the 1970s and 1980s, Tolman’s work served as a basis for Howard and Cohen, Myers and Shocker, amongst others, to elaborate the first means–end models [23–25]. Their approaches all share the same objective of amalgamating a selected stimulating force (e.g. set of values, goals in life) with the physical–chemical–technical product attributes relevant to the conception of marketing activities. The “means–end” model developed in the 1980s by Gutman and Reynolds can be considered a combination of all previously known approaches [26–28]. As Fig. 3 shows, the fundamental structure of this model consists of three elements, namely attribute, utility component and set of values.
It is initially useful to break down the attributes according to their level of abstraction [22,29]. An attribute is considered to be concrete if its various levels describe the physical–chemical–technical constitution (e.g. with heel supports) of a product (e.g. Nike sports shoes). It can generally be observed directly or measured objectively, and often exhibits a finite number of discrete states. Whereas this type of attribute is normally only able to reflect one facet of a phenomenon, an abstract attribute permits a comprehensive description of a product (e.g. good fit). The level of this type of attribute in a particular product depends on the subjective opinion of the individual rather than on objective facts.

According to utility theory, the functional utility of a product is derived from its features [30–32]. This utility specifies the usefulness of the product as well as embracing the consequences of the product’s actual usage (e.g. can run faster). The socio-psychological utility, on the other hand, includes all extras which are not vital to the actual function of the product, for example product attributes which enhance the aesthetic appearance of the product or the social acceptability of the buyer (e.g. feel relaxed after running).

Rokeach has suggested that sets of values represent series of individual standards — which remain constant over a period of time — serving to formulate goals in life and to put them into practice in everyday behavior. A set of values thus constitutes an explicit or implicit conception of ideals, characteristic of the individual concerned, which control the choice of a particular mode, instrument (means) and goal (end) of conduct. This view is also held by Rokeach, who defines a set of values as “…an enduring belief that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence …” [33,34]. By “an enduring belief in preferable modes of conduct and end-states of existence”, the author does not simply mean a cognitive representation or conception of what must be done and achieved. He instead attributes affective and cognitive components to the set of values (or the goals in life) over and above the cognitive component. This idea stems from Rokeach’s definition of the term “value” as an “…intervening variable that leads to action when activated …” [33, p. 7; 35].

It follows from this definition that a distinction needs to be drawn between terminal (end states of existence) and instrumental (modes of conduct) values. The terminal values, which embody desirable goals in life, can be further subdivided into personal values and social values. The group of personal values includes, inner harmony, serenity and maturity in love, whereas global peace, national security and a world full of beauty belong to the class of social values. The instrumental goals in life, which represent a desirable form of behavior,
consist of moral and achievement-oriented values, whereas tolerance, willingness to help and a sense of responsibility are examples of moral values. The set of achievement-oriented values comprises such attributes as logical, intellectual and imaginative. In our example, “physical fitness” can be classed as an instrumental value and “self-esteem” as a terminal value [36,37].

The chain depicted in Fig. 3 which represents a small part of the knowledge structure of an individual [38,39], can be constructed using the specified means-end elements. A consumer’s intention to purchase a product (e.g. Nike sports shoes) initially causes the concrete (e.g. with heel supports) and abstract (e.g. good fit) attributes associated with it to be activated. This impulse is then propagated via the functional (e.g. can run faster) and socio-psychological (e.g. feel relaxed after running) utility components before finally reaching the instrumental (e.g. physical fitness) and terminal (e.g. self-esteem) values.

2.2. The customer satisfaction concept

A supplier is faced with the constant challenge of achieving maximum possible customer satisfaction. The significance of the satisfaction rating for assessing the quality of a product derives from its function as an indicator of actual purchasing behaviour [40]. The customer’s (dis)satisfaction is the outcome of a complex information processing process, which essentially consists of a desired–actual comparison of a consumer’s experience with a purchased product or service (actual) and his expectations with regard to the fitness of this product or service for its intended purpose (desired). The congruence or divergence yielded by this comparison between the perceived product quality and the anticipated quality is expressed as the consumer’s (dis)confirmation. Of the many attempted definitions, the one best suited for the purposes of this work is that put forward by Anderson: “…consumer satisfaction is generally construed to be a postconsumption evaluation dependent on perceived quality or value, expectations and confirmation/disconfirmation — the degree (if any) of discrepancy between actual and expected quality…” [41, p. 20].

Whether or not an individual considers his expectations to be confirmed by a purchase, so that he is satisfied with the performance of the supplier, is primarily dependent on the perceived quality. Quality perception is directly linked to the purchase and consumption experience, and can be defined as a consumer’s global judgement in relation to the fitness of a product for its intended purpose [42]. The individual concerned assesses each of the purchased product’s attributes that are of relevance to him with regard to their suitability, and then integrates the partial ratings in accordance with a decision-making rule to obtain a quality judgement. The buyer’s expectations represent a specific level of quality that he hopes to find in the product. They serve as a yardstick for appraisal by the purchaser, which can be used to measure the consumed product or service. The level of expectation is determined firstly by previous consumption experiences, in other words by past encounters with the product in question [43]. Secondly — and this applies in particular to situations in which a product is purchased and consumed for the first time — the consumer obtains, in addition to other preliminary information, an idea of the quality of the contemplated product, above all from the prices of the available alternatives. If the product in question matches the consumer’s conceptions in every respect, he will be satisfied it.

The relevance of a satisfaction rating to the success of a company is evident [44]: as numerous studies have demonstrated, satisfied customers exhibit considerable loyalty in respect of a product or service that they have already purchased previously from the same supplier. The repeat buying rate which is a consequence of this helps to secure a permanent sales basis for the company, so that loyal customers can be considered to represent an asset value.

A further argument that can be advanced is the reduction in a customer’s price elasticity that accompanies a high level of satisfaction. Satisfied consumers exhibit a greater willingness to pay higher amounts for products and services, and consequently does not immediately defect to a lower-priced competitor when faced with a price increase. This low price sensitivity opens up a whole range of potential courses of pricing-policy action for the
supplier concerned, while at the same time restricting the tactical options of his rivals. Even substantial price discounts or gratuitous additional services (such as delivery and maintenance free of charge) are likely to be insufficient to entice away a satisfied customer.

Customer satisfaction moreover enhances the cross-selling potential of a supplier, as satisfied customers display a greater tendency to purchase larger quantities or possibly other products or services belonging to the same range. Finally, another factor having a positive effect on the success of a company is the more marked inclination of satisfied customers to relate the advantages of a product (and perhaps also the disadvantages of rival products) to other consumers [45]. This word-of-mouth advertising is distinguished by a high level of credibility, and the task of canvassing new customers is consequently simplified. In addition, the good reputation of the supplier which automatically ensues is useful when it comes to placing new products on the market successfully, or to occupying crucial sales channels and securing efficient and capable subcontractors.

The extent to which a manufacturer contrives to design the quality of a product in line with consumer’s wishes is expressed by the satisfaction rating of the buyers. It is they who provide the necessary information about the success of product policy activities and thereby play a central role within the controlling system framework. By gathering judgements, it is possible to extrapolate means for improving the quality of a product or for assimilating it more closely with the conceptions of potential actual customers.

2.3. The extended quality function deployment approach

The standard QFD approach attempts to translate attributes of a product into design features. The design features are subsequently transformed into parts features, operational procedures and production requirements (see Fig. 1). This approach suffers from two problems: Firstly, physical, chemical or technical product attributes are generally taken as a basis for specifying part features, operating procedures and production requirements. Modern marketing theory however suggests that consumers do not consider a product as a package of attributes, but rather think of it as a set of utility components, while behavioral scientists assert that stimulating forces, such as values, possess the most important impact on individual actions [12]. The means–end theory, to which considerable attention has been devoted in recent years by many researchers, enables the attributes relevant to the design of product quality to be associated with the determinants of purchasing behavior (set of values). Only by developing a product along these lines can such values be accomplished, and this accomplishment is subsequently reflected in the customer’s satisfaction with a company’s performance. Secondly, the standard QFD-approach does not provide any framework or technique for measuring customer satisfaction. Since these judgements are important indicators of future purchasing behaviour, a company can improve its product by analysing customer satisfaction. In other words, the satisfaction ratings should be the basis for product modifications.

Fig. 2 shows an extended QFD approach that enhances the standard QFD approach with two new aspects: Firstly, the model is used to take account not only of the purchase-decision-relevant product attributes, but also of the behaviour-forming utility dimensions and values of the consumer. By considering utility dimension and values product development is associated to the actual drivers of individual actions. Secondly, the success of the product which is developed in such a way needs to be measured by customers’ satisfaction ratings. These ratings reflect the extend to which customers’ need are fulfilled by the product and provide valuable advises for product improvement.

The extended QFD approach was adopted by German Rail in 1996 in order to develop products and services which meet customers’ expectations. A market-driven product and service design is essential for all InterCity links with international competition, such as the link between Frankfurt and Paris. The following case study conducted for the German Rail illustrates the use of the extended QFD approach.
3. Market-driven product and service design at German Rail

During the course of the next few years, the market for long-distance railway passenger traffic will undergo a radical transformation. One fundamental innovation, which goes well beyond all EU regulations, came into effect in January 1994: third parties are in principle permitted access to the state railway network. Any company able to offer a guarantee of safe operation is essentially allowed to use the railway lines in return for payment of a fee. This possibility of access to the railway network is also open to the trains of foreign operators (e.g. the Swiss Federal Railway and French National Railways). Conversely, German Rail will be allowed to use its own trains on foreign routes. In order to meet this challenge, German Rail is introducing a system of market-oriented quality management. This would appear to be the only feasible means of measuring the wants of potential and actual domestic and foreign passengers, and of transforming this data into a set of specifications for designing services. The various service offers put together in this way are verified within the framework of a customer satisfaction study, in order to determine whether or not — and if so, to what extent — they correspond to customers’ expectations [46,47].

German Rail is to implement this concept in three steps, which are described here taking the example of the already competing InterCity links on the route between Frankfurt and Paris: first of all, the wishes of potential and actual domestic and foreign customers with regard to the quality of service on the InterCity trains in question must be determined. Various methods, such as the repertory grid approach, the laddering interview, the content analysis and the laddering method are used for this purpose. The next step is to transform these abstract customer conceptions into concrete quality attributes. This task can best be accomplished by means of a conjoint analysis on the basis of the information acquired as described above. Finally, the fitness of the offered services for their intended purpose is examined, with particular emphasis on satisfaction measurement [48,49].

3.1. Identifying customer needs

The methods for transforming abstract customer expectations into concrete quality attributes (repertory grid approach, laddering interview, content analysis and laddering method) are not applied in isolation within the framework of a means–end analysis, since it is only their interaction which enables precise starting points for designing services to be identified. Their suitability can be demonstrated with the aid of a study conducted in April, May and June 1996 on the InterCity link between Frankfurt and Paris. A total of 186 respondents were interviewed (110 from Germany and 76 from France). The various constituent steps of these methods are described below [50].

The repertory grid method attempts to determine the product attributes that are significant for the choice of a particular means of transport (own car, bus, IC train belonging to German Rail, IC train belonging to French National Railways, Lufthansa flight, Air France flight). For this purpose, the interviewees are presented in each of a series of interview rounds with different triplets of transport means, and then prompted to name those attributes which create a similarity between two of the three alternatives, while at the same time establishing a dissimilarity from the third. This process continues until the consumers are unable to specify any new attributes and a comprehensive attribute list — including details of the number of mentions — has been produced. Next, the test persons are asked to name the two levels of each relevant attribute (e.g. journey time) which exhibit the greatest contrast (dichotomy) and which represent their positive (e.g. completes the journey between Frankfurt and Paris in one hour) and negative (e.g. takes at least five hours) attribute poles. This raw data can be used to construct a matrix, the top row of which contains all the potential means of transport and the two poles of each of the specified attributes. Finally, the respondents are requested to state whether the level of the various attributes in each alternative corresponds more closely to the positive pole or to the negative pole. Their judgments can be coded 1 (actual level corresponds to the positive pole) and 0 (actual level corresponds to the negative pole), and entered in the matrix cells [51].
The laddering interview represents a useful tool for determining the utility components of transport means and their underlying sets of values. It can be described as a non-standardised interview conducted with a knowledge of psychology. The objective is to investigate the behaviour-forming forces which determine an individual’s choice of alternative. It consists of a series of consecutive “why?” questions designed to cause the respondents to reveal certain facets of their imagination, from abstract product attributes to terminal values. This procedure is summarized extremely succinctly by Olson and Reynolds [52, p. 82]: “The purpose of laddering is to force the consumer up the ladder of abstraction ... to uncover the structural aspects of consumer knowledge as modeled by the means–end chain ...” [53].

On this basis, the laddering interview can be described as an investigation technique comprising a series of interview rounds. The first round is concerned with establishing why the concrete attributes identified by means of the repertory grid method (e.g. comfortable furnishings) carry such weight for the consumer’s choice of a particular means of transport. The abstract attributes (e.g. pleasant journey) which are reconstructed from the answers form the basis for examining the functional utility components (e.g. feeling of luxury) of the alternatives in question in the second round. The aim of the third round is to develop a conception of the psychological utility components (e.g. feeling good) associated with the relevant means of transport, while taking account of the respondent’s previous mentions. The interview continues until the individuals have disclosed the desired information about their instrumental (e.g. enjoyment of life) and terminal (e.g. zest for life) values.

Following the interviews, methods of analysing the linguistic statements that have been set down in writing are applied. The approaches developed so far, which can all be subsumed under the heading of content analysis, essentially consist of heuristics for interpreting a transcribed interview. The primary aim of this work is not to elaborate a syntactic description of all 186 of the available data records, but rather to reconstruct the social reality of the selected travellers. It consequently appears reasonable to elevate the inference of text-internal from text-internal attributes to the status of the constitutive element of this content analysis. In doing so, we satisfy the methodical prerequisite for inferring the subjective reality from the available raw data or, put another way, the non-manifest context from the attributes of a manifest text.

The central propositions of any document can be revealed using words, sentences and paragraphs. The decision to employ a particular linguistic unit (configurations) depends on where the pointers to the determinants of individual behaviour are concealed. When specifying the most suitable configurations for a study, it is important to remember that the document’s message is frequently manifested in a variety of linguistic units. The set of values of an individual, for example, can be expressed both by the sentence I want to get the best out of life and by the word hedonism. It would however appear rash to draw conclusions about a respondent’s set of values, for example, from individual configurations which express his or her positive or negative judgments in relation to specific phenomena. A word or a sentence usually only acquires its meaning when placed in a context with other linguistic units.

Owing to the extreme importance of a carefully elaborated system of categories for the results of the study, the available material was analysed by three recognized scientists. They are all qualified psychologists with extensive experience in interpreting raw data of this kind. The collection of the raw data can be described in two steps: Firstly, 186 repertory grid interviews were carried out in order to identify relevant attributes. Secondly, the same respondents were asked to participate in a laddering interview. The researchers took the stated attributes, benefit components and values as a basis for defining a total of 25 categories, corresponding to the individual elements of the means–end chain. Table 3 reveals, for example, that low price and comfortable furnishings are concrete attributes, whereas zest for life and self-esteem represent terminal values.

These defined categories served as a framework for specifying the individual means–end chains, which — to ensure a consistent linguistic prescription — are referred to as means–end ladders. This can be illustrated by two examples: the short journey time (concrete attribute) plays a crucial role in
Table 3
Means-end elements and their categories

<table>
<thead>
<tr>
<th>Means-end element</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete attributes</td>
<td>Price, journey time, connections, furnishings, catering, communications equipment</td>
</tr>
<tr>
<td>Abstract attributes</td>
<td>Reasonable cost of travel, pleasant journey, ecological way of travelling, possibility of working</td>
</tr>
<tr>
<td>Functional utility components</td>
<td>Spontaneous course of journey, getting to know new people, feeling of luxury, no wasted resources, getting things done</td>
</tr>
<tr>
<td>Psychological utility components</td>
<td>Travel experience, feeling good, making things happen, well-balanced lifestyle</td>
</tr>
<tr>
<td>Instrumental values</td>
<td>Success, enjoyment of life, living responsibly</td>
</tr>
<tr>
<td>Terminal values</td>
<td>Recognition, zest for life, self-esteem</td>
</tr>
</tbody>
</table>

the eyes of the first respondent asked to choose a means of transport. This journey time is an indicator of a pleasant journey impression (abstract attribute). The customer sees an opportunity to get a lot of things done (functional utility component) and to make things happen (psychological utility component) by choosing a fast means of transport. This experience is perceived as a success (instrumental value) and a means of gaining recognition from other people (terminal value). The second interviewee, on the other hand, is more concerned with a low level of harmful emissions from the chosen means of transport (concrete attribute). In this person’s opinion, the environmental compatibility of the transport alternative (abstract attribute) is crucial. This traveller wishes to choose a form of transport that wastes as few resources as possible (functional utility component), and in doing so to end up feeling good (psychological utility component). This mode of travel creates a feeling of living responsibly (instrumental value) and has the effect of enhancing self-esteem (terminal value).

These individual means–end chains can be combined to form a hierarchical value map, containing all the element connections mentioned most frequently by the respondents. Fig. 4 displays the hierarchical value map obtained for our study. 86% of all means–end chains mentioned by the respondents are shown in the figure. Four different passenger types were distinguished on the basis of the mapped means–end chains:

- The pleasure-seekers (60 respondents): The members of this group are conspicuous for their zest for life. In their opinion, a journey is an experience to be enjoyed. It is therefore very important to them to take a means of transport that offers a certain luxury. When choosing an alternative, they pay particular attention to the quality of the furnishings (e.g. seats, toilets) and to a good catering service.
- The price-conscious (33 respondents): The respondents that make up this group are distinguished by their yearning for self-esteem. This is backed up by their aim of being there for other people and by their rejection of an extravagant lifestyle. They therefore subject the available transport alternatives to a comprehensive economic analysis. Their decision in favour of a particular form depends ultimately on its price.
- The adventurous (48 respondents): These persons also exhibit a marked zest for life. Their desire to experience things as they travel is expressed in the spontaneous course of the journey and in the fact that they make a large number of social contacts. Comfortable furnishings and an adequate catering service are particularly important in the eyes of these individuals.
- The business travellers (45 respondents): The respondents subsumed within this group long to gain recognition. This is reflected in the great ambition with which they pursue their professional goals. It is therefore important to them to be able to get on with their work during the journey. The furnishings and the journey time offered by the chosen means of transport are thus crucial, along with the communications equipment (e.g. fax, telephone, e-mail).
By taking additional sociodemographic data into consideration it can be seen that the descriptions of the four groups are not just labels. For example, 41 of the 48 business travellers (see group 4) are actual business people, whereas the other 7 individuals behave like business people and possess a utility and value system which is typical for business travellers. In fact some of the 7 respondents are retired managers, others are students, and some of them did not reveal their profession.

Now that the wishes of potential and actual customers have been determined, the next step is to transform these abstract customer expectations into concrete quality attributes. Conjoint measurement is a suitable methodical basis for specifying the services provided on German Rail’s InterCity route between Frankfurt and Paris.

3.2. Creating services

In recent years the conjoint measurement method has proved extremely effective for specifying corporate performance [12,54]. Numerous practical applications, such as the conception of a new car model, the development of detergents, planning of the services provided by an airline company, the structure of the individual components of collective bargaining agreements, modifications to mechanical and plant engineering products and repositioning of delicatessen items, have demonstrated the enormous possibilities opened up by the conjoint measurement method for designing new products and for differentiating and varying existing ones [55,56].

The objective shared by all these studies is to determine the relevant utility values of the individual levels of product attributes from empirically obtained global consumer judgements concerning multi-attributive alternatives. Thus, we do not combine the individual, attribute-specific judgements to form a global judgement (compositional approach), but instead follow precisely the opposite procedure in extracting the partial contributions of the individual attributes and their levels from the...
global judgement (decompositional approach). The alternatives in question are constructed prototypically or fictitiously by systematically combining the levels of all the attributes found to be significant within the framework of the means–end analysis. The people responsible for production and for research and development can thus be provided with accurate information about the different attribute levels of a product that is considered by potential consumers to be attractive.

To recapitulate, six distinct attributes (price, furnishings, catering, journey time, connections and communications equipment) are especially relevant to the choice of a particular means of transport (see Fig. 4). A preliminary study established that a total of 20 different attribute levels are important (see Table 4).

From these attribute levels 1152 (\(4 \times 4 \times 2 \times 3 \times 4 \times 3\)) different means of transport can theoretically be constructed. However, in order to avoid overtaxing the respondents and to restrict the amount of collected data, an experimental design was used, allowing the number of possible combinations to be reduced to 24 different alternatives without losing any vital information. Variant 1, for example, consists of the following levels: ticket price DM 150, journey time 3 hours with no change, 2nd class, snack bar, telephone, fax and computer workstation. Variant 24, on the other hand, is made up of a ticket price of DM 270, a journey time of 4.5 hours, including a change, 1st class, with restaurant and telephone.

The 186 test persons were given the task of arranging the 24 descriptions presented to them on cards in order of preference. The resulting ranking order was then used as data input for the conjoint measurement method. The analysis yields were normalised, directly comparable partial utility values for the individual attribute levels. The attribute utility bands shown in Table 5 indicate the importance of these values (separately according to target groups). The table also shows the (segment-specific) partial utility values of each attribute, which express the attributes’ relative importance for the formation of an order of preferences.

Amongst other things, the results (which have been modified slightly out of consideration for German Rail) reveal that for the adventurous group the most important attribute is the price (25%), followed by the furnishings (23%) and the catering (20%). The business travellers, on the other hand, pay the greatest attention to the communications equipment (22%), the furnishings (20%) and the journey time (16%). In addition, it is noticeable that in the pleasure-seeking segment, for instance, an increase in the ticket price from DM 150 to DM 210, from DM 210 to DM 270 and from DM 270 to DM 330 results in a reduction in utility of 0.041 \((= 0.132 - 0.091)\), 0.008 \((= 0.091 - 0.083)\) and 0.072 \((= 0.083 - 0.011)\) units respectively. The willingness of passengers to pay for individual attributes can be determined simply by proportionalis- ing the partial utility values obtained with this calculation. For example, exhibits a utility difference between the

<table>
<thead>
<tr>
<th>Feature</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>(1) DM 150, (2) DM 210, (3) DM 270, (4) DM 330</td>
</tr>
<tr>
<td>Journey time</td>
<td>(1) 1.5 h, (2) 3 h, (3) 4.5 h, (4) 6 h</td>
</tr>
<tr>
<td>Connections</td>
<td>(1) Direct, (2) with change</td>
</tr>
<tr>
<td>Furnishings</td>
<td>(1) 1st class, (2) 2nd class, (3) bistro style</td>
</tr>
<tr>
<td>Catering</td>
<td>(1) Reserved seat, (2) restaurant, (3) bistro, (4) snack bar</td>
</tr>
<tr>
<td>Communications equipment</td>
<td>(1) Telephone, fax and computer in conference room, (2) telephone, fax and computer workstation, (3) telephone</td>
</tr>
</tbody>
</table>
Table 5
Part worth of attribute levels and attribute importances

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Attribute levels</th>
<th>Passenger types</th>
<th>The pleasure seekers</th>
<th>The price conscious</th>
<th>The adventurers</th>
<th>The business travellers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Part worth of attribute level</td>
<td>Attribute importance</td>
<td>Part worth of attribute level</td>
<td>Attribute importance</td>
</tr>
<tr>
<td>Price</td>
<td>(1) DM 150</td>
<td></td>
<td>0.132</td>
<td>43%</td>
<td>0.231</td>
<td>69%</td>
</tr>
<tr>
<td></td>
<td>(2) DM 210</td>
<td></td>
<td>0.091</td>
<td></td>
<td>0.113</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) DM 270</td>
<td></td>
<td>0.083</td>
<td></td>
<td>0.091</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) DM 330</td>
<td></td>
<td>0.011</td>
<td></td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Journey time</td>
<td>(1) 1.5 h</td>
<td></td>
<td>0.061</td>
<td>11%</td>
<td>0.059</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>(2) 3 h</td>
<td></td>
<td>0.052</td>
<td></td>
<td>0.048</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) 4.5 h</td>
<td></td>
<td>0.041</td>
<td></td>
<td>0.040</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) 6 h</td>
<td></td>
<td>0.030</td>
<td></td>
<td>0.029</td>
<td></td>
</tr>
<tr>
<td>Connections</td>
<td>(1) Direct</td>
<td></td>
<td>0.035</td>
<td>6%</td>
<td>0.034</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>(2) With change</td>
<td></td>
<td>0.020</td>
<td></td>
<td>0.022</td>
<td></td>
</tr>
<tr>
<td>Furnishing</td>
<td>(1) 1st class</td>
<td></td>
<td>0.081</td>
<td>17%</td>
<td>0.062</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>(2) 2nd class</td>
<td></td>
<td>0.052</td>
<td></td>
<td>0.053</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Bistro style</td>
<td></td>
<td>0.030</td>
<td></td>
<td>0.043</td>
<td></td>
</tr>
<tr>
<td>Catering</td>
<td>(1) Reserved seat</td>
<td></td>
<td>0.081</td>
<td>20%</td>
<td>0.057</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>(2) Restaurant</td>
<td></td>
<td>0.062</td>
<td></td>
<td>0.052</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Bistro</td>
<td></td>
<td>0.044</td>
<td></td>
<td>0.045</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Snack bar</td>
<td></td>
<td>0.020</td>
<td></td>
<td>0.040</td>
<td></td>
</tr>
<tr>
<td>Communications equipment</td>
<td>(1) Telephone, fax and computer in conference room</td>
<td></td>
<td>0.020</td>
<td>3%</td>
<td>0.031</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>(2) Telephone, fax and computer workstation</td>
<td></td>
<td>0.018</td>
<td></td>
<td>0.023</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Telephone</td>
<td></td>
<td>0.012</td>
<td></td>
<td>0.018</td>
<td></td>
</tr>
</tbody>
</table>
'telephone, fax and computer in conference room’
level (0.020) and the 'telephone' level (0.012). This
difference of 0.008 utility units can be converted to
a figure of around DM 11.

Assuming the same overall utility, the members
of this group are thus willing to pay DM 11 more to
travel on the InterCity route between Frankfurt am
Main and Paris if the train is equipped with a tele-
phone, fax and computer workstation than if it is
only able to offer a telephone. A reduction in the
journey time from 3 hours (0.052) to 1.5 hours
(0.061), on the other hand, appears to interest them
relatively little. Furthermore, a direct connection
(0.061) does not significantly enhance the attract-
iveness of the transport service as compared with a
journey involving a change (0.020). If, however,
German Rail offers a first-class journey (0.081) in-
stead of/or as well as a second class trip (0.052),
the overall utility can be increased by 0.029
(= 0.081 − 0.052). This improved utility that results
from the more luxurious furnishings is rewarded by
a willingness to pay an additional DM 43.

An enhancement of the offered range of services
constitutes an advantage from the point of view of
the customer, providing the overall utility gain
brought about by varying the service components
is greater than the utility loss caused by the higher
price. On the other hand, it is not difficult to
imagine that it could prove extremely expensive
for German Rail to put together exactly the pack-
age of services that is considered by passengers to
offer the maximum utility. Although offering this
service bundle might well lead to an increase in
the market share, this would not necessarily be
accompanied by a rise in profits. German Rail
would consequently be well advised when design-
ing its service packages to concentrate on those
attribute levels which offer a high utility value to
passengers, while requiring relatively little effort on
the part of the operator. The relevant attributes
might thus also be termed low-cost utility drivers.
The outcome of this approach is that the measured
partial utility values are contrasted with the costs
involved. It is therefore ideal for assembling a ser-
vice bundle that maximises profits rather than mar-
ket shares.

We must first determine the variable costs of the
individual attribute levels before turning our atten-
tion to identifying the low-cost utility bringers.
Since this information is confidential, we are unable
to give details of these costs here. A set of services
that together constitute a service bundle and that
embody the essence of the advertising message was
determined for each segment on the basis of
cost–benefit criteria. These packages were con-
structed by weighing up the partial utility values
and the variable costs of each attribute level (out of
consideration for German Rail, we cannot specify
these any further). They are not optimum-utility
bundles designed to achieve the maximum possible
market share, but rather packages aimed at maxi-
mising profits by addressing customers’ wishes and
bearing in mind the costs they entail [57].

The means–end chains shown in Fig. 4 can be
used together with Table 5 to orient the range of
offered services towards specific segments. These
chains indicate which attributes, utility compo-
nents and sets of values the members of each group
associate with the different transport services. This
information can be taken as a basis for elaborating
a service — which is linked by the passengers in
a particular cluster to all the elements of their own
means–end chain — in accordance with marketing
principles. A service bundle designed in this way,
backed up by a corresponding advertising message,
is a prerequisite of a corporate performance that is
capable of gratifying wants on all levels.

This idea can be illustrated by taking a glance at
the means–end chain of the group of individuals
referred to as “business travellers”. This chain
embraces three concrete attributes (modern commun-
ications equipment, de-luxe furnishings and a short
journey time as possible) that are associated
via two utility components (making things happen
and getting things done) with two different values
(success and recognition). Pointers to the contents
of a core message aimed at this specific segment can
be inferred from these means–end elements. It
should be clear to the management that business
travellers want to make the journey between
Frankfurt and Paris in InterCity trains belonging
to German Rail. Thanks to modern communica-
tions equipment, de-luxe furnishings and a short
journey time, he or she will be able to complete
important work while travelling — something
which earns the recognition of others.
Having specified the InterCity services between Frankfurt and Paris, it was interesting to observe the success of these measures. Six months after their implementation, we therefore measured the satisfaction of passengers with the services offered by German Rail. The widely used concept of customer satisfaction formed the methodical basis for this study.

3.3. Measuring customer satisfaction

An empirical study conducted in June and July 1997 attempted to measure the satisfaction of 442 passengers with the service offered by German Rail on the route in question, and to provide a basis for deriving possible courses of marketing action. Following the example set by other similar empirical analyses, the theoretical concept of “satisfaction” was subdivided into two separate components. The cognitive component expresses the perceived quality of the services, while the affective component provides an indication of their importance. This method of investigation demands that the relevant dimensions be chosen very carefully. The concrete attributes identified as relevant with the aid of the means–end analysis thus suggest themselves here. To recollect, these attributes are price, journey time, connections, furnishings, catering and communications equipment.

The importance of the individual service dimensions for the interviewed persons must be established first of all. The passengers can then be subdivided into various segments according to these mentions. Once these clusters have been identified on the basis of the importance judgements, it is possible to verify the fitness of the segments that were derived from the partial utility values. In the event that this new approach also yields “pleasure seekers”, “price conscious”, “business travellers” and “adventurous” clusters, the four-group solution is confirmed as a suitable method for segment-specific market analyses.

The data was collected by asking the respondents to state the importance of the individual service dimensions on a scale ranging from 1 (not important at all) to 7 (very important). A cluster analysis was used to subdivide the interviewed persons into segments according to the proximity of their importance judgements. The clusters are formed by grouping together those individuals whose importance judgements exhibit the greatest similarity; the clusters themselves are as dissimilar as possible.

These importance judgements of the 442 respondents serve as input for a hierarchical classification. Based on the clustering agglomeration coefficient the four-segment solution was chosen after analysing the results [54]. The importance values shown for the service dimensions in Table 6 can be calculated for each group from the cluster mean values for the individual variables. It can be seen that the furnishings of the InterCity train and the catering are the most relevant attributes for the members of cluster 1. These mentions are in line with the wishes postulated by the pleasure seekers. The respondents belonging to group 2, on the other hand, pay particular attention to the price. Their wants thus coincide with those of the price conscious passengers. The respondents subsumed within group 3 set great store by the furnishings and the catering. A glance at the importance ratings accorded to the other attributes is sufficient to confirm a similarity with the profile of the adventurous passengers. As far as the individuals that make up group 4 are concerned, it is the communications equipment, the journey time and the furnishings that are especially relevant. They thus focus on the same attributes as the business travellers.

The test persons were subsequently asked to specify their satisfaction with the individual service dimensions on a scale from 1 (very dissatisfied) to 7 (very satisfied). The satisfaction values determined for the four above-mentioned clusters are shown in Table 6. If the importance values contained in this table are compared with the satisfaction values, it can be seen that the service considered by each group to be the most satisfactory is not necessarily also the most important. This can be shown by means of a correlation analysis. This method measures the strength of the correlation between the importance of a particular service and satisfaction with it as expressed by the respondents in each group, and identifies the correlation direction (parallel or anti-parallel).

The values obtained in this way were 0.77 for the first group (pleasure seekers), −0.28 for the
Table 6

<table>
<thead>
<tr>
<th>Service dimensions</th>
<th>Cluster 1</th>
<th>Cluster 2</th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with service dimension</td>
<td>3.0</td>
<td>1.8</td>
<td>2.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Importance of service dimension</td>
<td>2.9</td>
<td>2.9</td>
<td>3.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Satisfaction with service dimension</td>
<td>2.5</td>
<td>1.4</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Importance of service dimension</td>
<td>2.1</td>
<td>4.0</td>
<td>3.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Satisfaction with service dimension</td>
<td>3.6</td>
<td>2.1</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Importance of service dimension</td>
<td>1.2</td>
<td>4.3</td>
<td>2.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Satisfaction with service dimension</td>
<td>2.0</td>
<td>1.5</td>
<td>2.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Importance of service dimension</td>
<td>2.8</td>
<td>2.4</td>
<td>4.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Satisfaction with service dimension</td>
<td>1.8</td>
<td>3.3</td>
<td>2.8</td>
<td>2.3</td>
</tr>
<tr>
<td>Importance of service dimension</td>
<td>2.0</td>
<td>3.1</td>
<td>2.3</td>
<td>2.2</td>
</tr>
<tr>
<td>Satisfaction with service dimension</td>
<td>1.5</td>
<td>3.4</td>
<td>2.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Importance of service dimension</td>
<td>1.7</td>
<td>3.2</td>
<td>1.8</td>
<td>2.1</td>
</tr>
<tr>
<td>Satisfaction with service dimension</td>
<td>3.0</td>
<td>1.5</td>
<td>2.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Importance of service dimension</td>
<td>2.8</td>
<td>2.8</td>
<td>3.5</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Second group (price conscious), 0.33 for cluster 3 (adventurous) and — 0.47 for group 4 (business travellers). Although the overall level of satisfaction with the performance of the railway is very low, these figures reveal that the passengers belonging to groups 1 and 3 are relatively satisfied with those service dimensions they consider to be most important. In the case of the customers in groups 2 and 4, on the other hand, there is a negative correlation between the two variables.

It is evident from the results of the empirical study firstly that there is a considerable need for service improvement on the part of German Rail with regard to the InterCity route between Frankfurt and Paris. The very poor performance on every dimension explains why German Rail suffers a competitive disadvantage especially with regard to other players in the transportation sector, such as airlines or cars. An analysis of the actual performance of German Rail on every dimension reveals that the design of each service is meets customers needs, but the way the services are delivered is very often poor. For example, many travellers complain the limited selection of beverages and sandwiches. In some cases light hot meals, such as hot dogs, pizzas, and spaghetti with tomato sauce, were cold when they were served. Another serious problem is the communication equipment in InterCity trains. It turned out that it was impossible to make a long distance call when the train was between Saarbrücken and Metz. The reason for this service failure is the limited compatibility of the German and the French telephone system.

Secondly, action should be aimed primarily at groups 2 and 4. To recapitulate, the persons belonging to cluster 2 (price conscious) regard the price and (to a lesser extent) the environmental compatibility of the means of transport as most important. In the light of this, the task facing the management is to make potential customers aware of the cost of alternative forms of transport by comparing them with the price of a ticket from Frankfurt to Paris. Not many car drivers are truly conscious of the actual costs entailed by driving one kilometre, not to mention the high inner-city parking fees. Moreover, it would seem advisable to draw this cluster’s attention to the problem of the harmful emissions produced by cars and
aeroplanes, in order to emphasise the attractiveness of travel by train [58,59].

The passengers that make up cluster 4 (business travellers), on the other hand, are concerned above all with comfortable furnishings, a short journey time and communications equipment. Regular care and maintenance of the first-class carriages is thus extremely important. It would also be a good idea to accept hire car and taxi bookings on behalf of passengers, and to provide detailed information regarding connections. It could furthermore prove advantageous for German Rail to cooperate with airlines in order to make travelling more convenient for business travellers. Stressing the performance of the communications equipment available in the train, along with the various other opportunities for accomplishing work of all kinds, might likewise constitute a strategy for success. We therefore recommend establishing contact with a variety of corporate organisations with a view to imparting the particular merits of railway travel to business travellers.

The usefulness of all these recommendations can be figured out by considering the means-end chains in Fig. 4. In order to attract more business travellers all additional services, such as taxi booking and cooperation with airlines and haulage contractors, must be associated with the utility and value expectations of these passengers. So German Rail need to explain that these services fulfill expectations like feeling of luxury, getting things done, making things happen, feeling good etc. (see Fig. 4).

4. Implications

Bridging the gap between a firm’s internal quality improvements and external measures of customer needs and satisfaction is an important yet complex translation process. The translation runs all the way from customer needs, to product and service attributes, through design, to production and service maintenance processes, and to customer satisfaction. This process has traditionally been studied within two very different domains. An external focus on customers has been the domain of marketers. Manufacturing and engineering-based approaches to quality management and improvement have traditionally taken a more internal, process improvement focus.

Both areas have recognized the need to broaden their focus and bridge the gap between internal quality and external customer needs and satisfaction. Engineers have become increasingly customer focused and strive to incorporate the voice of the customer into quality improvement models and methods, as evidenced by the growing use of quality function deployment and its house of quality. Similarly, externally focused market and consumer researchers have become more internally focused as they strive to translate customer needs and satisfaction into action implications. Simply put, both engineers and marketers are learning to wear multiple hats in a cooperative effort to increase business performance.

Bridging the gap between customer needs, product quality, and customer satisfaction requires a broad-based view in which external measures are translated into internal means of accomplishment. Existing translation tools and methods capture some, but not all, of this translation process. The framework developed here links a popular engineering-based translation method, quality function deployment, with a popular market-based approach, customer needs and satisfaction modeling. Together these approaches describe the breadth of activities involved in the translation process. Integration of the two approaches into a single framework, as described in Fig. 2, highlights several important phases in the translation process.

Both quality function deployment (QFD) and customer needs and satisfaction modelling (CNSM) use the similar logic: set priorities to improve those benefits, attributes, or internal processes that are important to customers and on which product or service performance is poor. CNSM adopts the “lens” of the customer to set priorities from customer needs to product and service attributes. QFD targets attributes and translates them through design and production. The methods thus operationalize very different yet complementary levels of the overall translation process. This complementarity is illustrated here using the customer needs and satisfaction model of German Rail.

Since several other companies like Daimler-Chrysler, the German Bank, Lufthansa, Pirelli,
Magna, Volvo, and Italian Telecom have adopted this extended QFD-approach the methodology has proved to be useful in several sectors. The German Rail example and the lessons learnt from other companies also identify hidden problems in the interface between the methods and the potential solutions. The distinction between benefits and attributes in CNSM is obscured in QFD; primary attributes in QFD are more abstract benefits while secondary and tertiary attributes in QFD are more concrete attributes. The implication is that very different approaches to measurement are required at the different levels; whereas benefits are latent variables that can only be measured indirectly using an index of survey measures, attributes are measurement variables that can be operationalized directly using individual survey questions. It is extremely important for the success of the whole procedure that the qualitative interviews are carried out very carefully. Therefore only qualified psychologists with extensive experience should be recruited for collecting, analysing and interpreting the data. All other steps are much more structured by the underlying techniques, such as conjoint or cluster analysis, with far less space for individual interpretation.

Two additional problems relate to consistency in the methods used to set priorities at different levels of the translation. The priority setting process is confounded when different approaches are used to measure benefit and attribute importance. Ideally, the method should involve statistical estimation of importance as the impact that a benefit or attribute has on customer satisfaction. Statistical estimation based on Conjoint Measurement is more objective and avoids many of the biases inherent in self-reported measures of importance.

Performance benchmarks should also remain consistent throughout the priority setting process. Otherwise the targeting of particular attributes or processes for improvement may be an artifact of the performance benchmarks used. Whereas benchmarks in CNSM and early in QFD tend to be more market segment driven or competitively relevant, benchmarks often grow to include admired peers outside an industry as the translation continues. While this broadening is important to point out what is possible in a product or service development process, it can confound the priority setting process per se and compromise customer focus.

References


