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Measuring service quality: a systems approach

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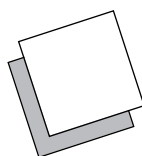
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# Measuring service quality: a systems approach

*Rose L. Johnson, Michael Tsiros and Richard A. Lancioni*

## Introduction

With the establishment of the Malcolm Baldrige Award in 1986 and the ISO 9000 standards in 1988, corporate interest in product quality increased. Many firms acted to alter their corporate structures and make their management cultures more quality oriented. Measures were developed to monitor product quality – including Deming's and Juran's process control methodologies. Firms began to develop monthly customer surveys to monitor their performance in terms of delivery, inventory in-stock position, technical support availability, damage incidence, and competence of customer service personnel.

Unfortunately, the move to institute more quality in products greatly outstripped action in the realm of service quality. The failure to measure and control service quality may have been caused by two factors.

First, the intangibility of most services is problematic since it can cause measurement difficulties and make research results unreliable. Service quality perceptions may vary a great deal across any given set of observations; while this could be related to actual variance in service performance, the difficulty of perceiving relatively intangible end results may also be at fault.

Second, service quality is considered by some to be impossible to model. That is, because so many factors affect an individual's perception of service quality, some researchers have found it difficult to isolate causal factors and draw any meaningful conclusions as to what influenced service quality ratings.

Many of the initial attempts to measure service quality were modeled after steps taken in product industries. As a result, those attempts tended to focus primarily on the end result, or output, of the production process. For example, the Ameritech Corporation in Chicago conducted a massive study of the quality of service provided to their residential telephone customers (Ameritech, 1993). The company looked at outputs of its service system such as equipment performance, effectiveness of repair and maintenance systems, clarity of voice transmission, and accuracy of its billing systems. However, it failed to consider aspects of service production such as the training of service personnel and the quality of employee-customer interactions.

The service quality studies done by British Airways monitored customer service through the use of customer surveys and audits. Focus was placed on flight arrival and departure times, meal quality, in-flight service, check-in experience, and baggage claim time (British Airways, 1991). Although the company focussed its attention predominantly on the end result of the

Failure to measure and control quality

Focus on end result

## Neglect of individual segments

service, an attempt at wider consideration of the service process (e.g. in-flight service) is evident.

Although the above examples are only two attempts to measure service quality, they are representative of many other such attempts. They show that when many companies measure service quality, they look primarily at the end results of their service provisioning cycles and tend to neglect the service components contributing to those end results. Ameritech looked primarily at the outputs of its service system, and measured them. British Airways used a more comprehensive consideration of the service, but still fell short in some areas.

There are, however, companies that take a more holistic view of the service production process. For example, McDonald's audits the over 12,000 restaurants that operate under the franchise worldwide on a quarterly basis. Included in the audit is an evaluation of physical facilities and other service production resources (e.g. atmosphere, cleanliness, seating arrangements, and operating hours), customer-employee interactions (e.g. politeness, friendliness, and courtesy of the sales staff), and end results (e.g. correctness of the order, quality and taste of the food, speed of order taking and processing; see The McDonald's Corporation, 1992).

## Essential for a service company

Being able to measure all dimensions relevant to service production is essential for a service company. With customers interacting with the service provider and being an integral part of the service production, the need to measure the customers' perceptions of all three aspects of the service is apparent. Just as essential is the ability to distinguish these aspects from each other and to evaluate them separately. This is because the company may be performing well in one area but not in another. By using distinct measures, firms can identify the most appropriate action and resources can be allocated more efficiently along the production process. The view of the whole picture will not, however, be sacrificed by focussing on any specific attribute of the service.

One instrument that was developed to satisfy these goals in service quality measurement is Parasuraman *et al.*'s (1988) SERVQUAL scale. This scale describes service quality as the difference between customer expectations for, and perceptions of, actual performance along five dimensions – tangibles, reliability, responsiveness, assurance, and empathy.

While the scale attempted to provide a generalizable measure of service quality, a number of studies have shown that such a claim may be inappropriate (e.g. Babakus and Boller, 1992; Brensing and Lambert, 1990; Carman, 1990). In addition, despite initial popularity among both practitioners and academics, SERVQUAL has recently been criticized on both conceptual and methodological grounds (e.g. Brown *et al.*, 1993; Cronin and Taylor, 1994; Teas, 1994).

Many other marketers have suggested the existence of multiple dimensions within the service quality construct. For example, Sasser *et al.* (1978) proposed three dimensions of service quality: material, facilities, and personnel. Lehtinen and Lehtinen (1982) suggested that service quality consists of the equipment used (physical quality), the image or reputation of

## Service provision is multifaceted

the company (corporate quality), and the interaction between contact personnel and customers (interactive quality).

Grönroos (1984) suggested that quality is a function of *what* the consumer actually receives (technical quality) and the *way* the service is delivered (functional quality).

LeBlank and Nguyen (1988) proposed five dimensions of service quality: corporate image, internal organization, physical support of the producing system, staff-customer interaction, and customer satisfaction. Edvardsson *et al.* (1989) suggested that service quality consists of personnel skills (technical quality), the coordination between the different portions of the service delivery system (integrative quality), the manner in which the service is delivered to the customer (functional quality), and the degree to which the service product meets customer expectations (outcome quality).

These frameworks share the notion that service provision is multifaceted. Despite the many typologies suggested, however, none except SERVQUAL has received extensive empirical testing. Thus, service firms are still faced with uncertainty when trying to identify an appropriate measure of service quality. Given the importance of measuring and controlling service quality and the shortcomings of existing efforts, additional work in this area seems warranted.

The purpose of this article is to describe and test a framework for the measurement of consumers' perceptions of service quality. Applying general systems theory, we will discuss the contribution of service inputs, processes, and outputs to overall quality perceptions. Then, we will present the results of two studies exploring the suitability of the framework. Finally, the managerial relevance and implications of our approach will be described.

### A general systems approach to services

General systems theory is a research paradigm which attempts to facilitate the generalization of behavioral principles across a wide range of organizations (Sirgy, 1984). The theory suggests that an organization, such as a service firm, consists of an arrangement of smaller subsystems (e.g. departments) and acts within a larger system – the environment. Two of the central themes of general systems theory are the interaction of subunits within a system and the interaction of the system with its environment (Kast and Rosenzweig, 1972).

## Systems theory

In the case of a production operation, systems theory explains how inputs are acquired from the environment; fed into the manufacturing cycle, where transformation of the raw material results in finished products; and, as finished products, marketed to customers as the output of the company.

Following the systems framework, inputs, processes, and outputs each play an important role in the successful operation of the firm. This is true for manufacturing firms where, for example, outdated or poorly maintained equipment can cause an unacceptable level of product defects. However, the systems approach is particularly relevant to the study of services and service quality.

### Assessment of input quality

In evaluating the quality of physical goods, consumers are concerned primarily with the good (system output) itself. Because of the unique characteristics of many services, however, consumers are exposed to and affected by the organization's inputs and processes as well as its outputs. Thus, a measure of overall service quality should include judgments of all dimensions of the service: inputs, processes, and outputs (see Figure 1).

As a result of services' simultaneous production and consumption, consumers often are present in the service production facility and are aware of the quality of the equipment and overall surroundings. Input quality, the first dimension, is the component of consumers' overall quality evaluations that includes consideration of these physical elements and other production resources, both tangible and intangible.

For example, an assessment of input quality would include consideration of whether the equipment seemed up to date and in good working order; whether waiting areas were appropriately furnished, cleaned, and well lit; and whether service providers were appropriately attired. The knowledge and skills possessed by employees represent important inputs to service production. Inputs may be acquired from the system under study or from other systems (Schoderbek *et al.*, 1990).

The second quality dimension, process quality, refers to the quality of the interaction between provider and consumer; that is, how the service is produced. Since service production and consumption are inseparable, consumers frequently must interact with service personnel. Thus, consumers often are directly affected by the service production process. Service accessibility and availability and provider's courtesy, friendliness, and willingness to answer questions are aspects of process quality.

Output quality, the third dimension, is a measure of what is produced as a result of providing the service. It includes intangible benefits as well as any tangible outputs of the service, and most frequently it involves a change in the consumer's physical or mental state or a change in some possession of the consumer's. It is concerned, for example, with whether a faucet still drips after the plumber's visit, or whether the consumer possesses a valid will after the lawyer's work is done, or the consumer's mental and emotional state after an evening of entertainment.

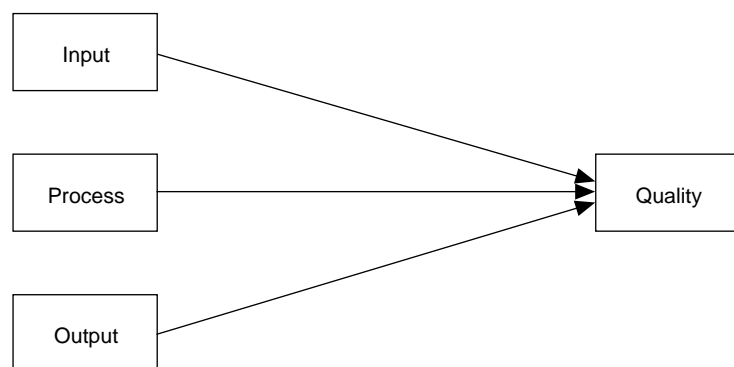


Figure 1. A systems approach to service quality

### Role of environment

The outputs of a system may be acquired by consumers or other systems for their own use, consumed by the same system in a subsequent production cycle, or disposed of as waste (Schoderbek *et al.*, 1990). When outputs are consumed by the same system, they are referred to as feedbacks. An example of feedback may be the knowledge and skills which are gained by employees through service provision and are then used to produce future services more efficiently. While some researchers view feedbacks as a separate system object, we include them as one type of input (cf. Schoderbek *et al.*, 1990).

The role of the environment – those things external to the system – should also be noted. By definition, the system is unable to control the environment, but the ability to monitor and respond to environmental forces is critical. If, for example, a firm does not keep abreast of social trends which may affect consumers' wants and needs, the firm's ability to produce outputs that consumers evaluate highly may be compromised.

Again, since we are focussing on consumer perceptions of service quality, the environment will have an impact only to the extent that it causes changes to the elements of the system. It is those system elements (inputs, processes, and outcomes) that will be evaluated here.

### Marketing and its functions as a system

A number of marketing researchers have used the systems framework in their work. For example, Reidenbach and Oliva (1981) conceptualize marketing and its functions as a living system – where some departments are responsible for the assembly of information and materials from the environment and the dissemination of those inputs to the appropriate departments, some departments are responsible for processing those inputs and converting them into appropriate outputs, and other departments are responsible for providing physical output and information back to the environment.

Ruekert and Walker (1987) use the systems framework to conceptualize marketing's interaction with other functional units of the company. They suggest three dimensions that describe these interactions. The input dimension includes environmental conditions such as resource dependence, complexity, and turbulence. The process dimension includes transactions, communication flow, and coordination patterns between marketing and other functional areas. The outcome dimension includes functional and socio-psychological outcomes such as accomplishment of the marketing department's goals, perceived effectiveness of the relationship, and conflict.

### Systems approach to evaluating service firms

Murphy and Ross (1987) advocate a systems approach to evaluating service firms. They state that "the processing and feedback stages, as well as inputs and outputs, are all crucial in gaining a complete evaluation of [service] firms" (p. 365). They also note that the input dimension has been criticized because of the sometimes tenuous relationship between a service provider's credentials and service performance, but then point out that for some services (e.g. medical care), consumers' lack of expertise for evaluating outputs may make the input dimension the most reliable.

Also consistent with general systems theory, Grove and Fisk (1992) suggest that the service process can be described in terms of inputs, throughputs (the service experience itself), and outcomes. They argue that, owing to the

## Overlap with systems theory

unique characteristics of services (intangibility, perishability, heterogeneity, simultaneity), the use of observational methods in services marketing is even more appropriate. They also recognize that observational methods may be most appropriate for researching throughputs but they argue that the evaluation of all three elements is both possible and important.

Each of the above-mentioned studies specifically invoked the systems framework. However, some overlap with general systems theory can be seen even in studies prescribing different frameworks or service quality dimensions. For example, in studying the relationship between advertising agencies and their clients, Michell (1987) found that dissatisfaction with agency performance is the main reason for campaign switching and that agency performance is evaluated as a function of creativity, client service, and campaign results. At a higher level of abstraction, these three factors represent inputs, processes, and outputs, respectively.

The several characterizations of service dimensions described earlier in this article also demonstrate some overlap with systems theory. The dimensions of material quality, tangibles, corporate image, technical quality, and physical support are consistent with the inputs dimension. Process includes interactive quality, staff-customer interaction, functional quality, assurance, and responsiveness. Finally, the output dimension is represented in outcome and reliability.

The validity of these frameworks is, as we suggested earlier, an empirical question that has not as yet been adequately addressed. It is interesting to note, however, that SERVQUAL includes five service quality dimensions, but in refining their scale, Parasuraman *et al.* (1991a, p. 425) observed that “the responsiveness and assurance dimensions show a considerable overlap and load on the same factor”. Within our framework they would both be parts of the process dimension.

## Two empirical studies were undertaken

### A test of the framework

While systems theory has been discussed and its use by service marketers has been advocated by some, there have been few efforts made to demonstrate the appropriateness of the model empirically for this use. This article attempts to close that gap. Two empirical studies were undertaken to test the appropriateness of the systems framework for describing service quality perceptions. One goal of the studies was to identify components of each of the three quality dimensions and to determine to what extent these dimensions explained variance in overall quality perceptions. A secondary goal was to determine the extent to which the framework and measures could be generalized across different service types.

### Study 1

A survey was conducted to measure quality perceptions of firms in three service industries: full service restaurants, banking, and public transportation. Business students at a large East Coast university provided 195 service evaluations. To ensure that respondents were actual consumers of the services they evaluated, respondents were asked to name and evaluate a full service restaurant they had visited in the last four weeks, or the bank they use most frequently. For public transport, respondents were asked to evaluate the local transit system if they had used the system in the last four

### Orthogonal rotation used

weeks. The questionnaires were randomly distributed among the respondents.

The survey included 29 service quality items measured on a five-point Likert-type scale. Some elements were adapted from the SERVQUAL scale while others were generated by the researchers. The service perception items were the same for each service type. For the initial evaluation of the input, process, and output scales, a factor analysis was run with three factors specified a priori.

This specification was made (rather than the inclusion of factors with eigenvalues greater than one) because three factors are specified by systems theory. An orthogonal rotation was used in order to keep the factors as independent of each other as possible. Bartlett's test of sphericity ( $V = 4,870$ ,  $p < 0.001$ ) indicates that the 29 variables are not independent and are, therefore, appropriate for factor analysis. The eigenvalues for each factor are provided in the Appendix.

Of the 29 initial items, nine were excluded because they did not load higher than 0.5 on their expected factor and lower than 0.5 on the other factors. Scale items and factor loadings are provided in Table I. Final Cronbach alpha values were 0.85 for the input scale (five items), 0.96 for the process scale (seven items), and 0.95 for the output scale (eight items). Several items measuring the input dimension were dropped owing to their low correlation with the input factor. Some of those items, such as measures of personnel's knowledge or training, may be hard for the customer to evaluate because of low involvement and infrequent interaction. Overall service quality was measured by a seven-point semantic differential item (very high quality/very low quality).

Factor ( $\alpha$ )	Item	Factor loading
Input (0.85)	The firm has a reputation for quality	0.67
	The firm has up-to-date equipment	0.64
	The firm's furnishings are in keeping with the type of service provided	0.61
	The physical facilities are visually appealing	0.58
	The waiting area is comfortable	0.51
Process (0.96)	The service providers are friendly	0.87
	The service providers seem happy to be of service	0.81
	The service providers take the time to answer questions clearly	0.81
	The service providers are responsive to my needs	0.80
	The service providers are courteous	0.77
	The service providers are attentive to my needs	0.75
	I receive individualized attention	0.66
Output (0.95)	The goals I had in seeking the service were fulfilled	0.82
	I receive the service I expect	0.78
	The service is performed right the first time	0.76
	The service outcome meets my expectations	0.74
	The service provides the benefits I desire	0.73
	The firm provides reliable service	0.71
	Service performance is dependable	0.66
	Services are provided when promised	0.64

*Table I. Scale items and factor analysis results*



### Differences across types of service

The next step was to test the model empirically (see Figure 1). We ran a regression analysis with overall service quality as the dependent variable and input, process, and output as the predictor variables. The overall model was significant and explained 73% of the variation in overall service quality.

This compares favorably with SERVQUAL, which Parasuraman *et al.* (1991a) found to explain 57-71% of the variation in overall quality depending on the type of service. Of the three dimensions, output was the strongest predictor of overall service quality, followed by process. With the effects of these two dimensions accounted for, the input dimension did not have a significant effect on overall service quality. The results of the analysis are provided in Table II.

While these initial results are encouraging, we recognize that there are important differences across types of services which may be obscured in our combined analysis. For example, owing to the greater interaction between customers and service providers in a restaurant as compared to a transit system, the process dimension may be a stronger predictor of quality in the former. Thus, we repeated our analysis for each type of service (restaurant, banking, and public transportation) separately.

### Strong and significant predictor

Results of the separate analyses were quite similar to the combined results (see Table II).  $R^2$ s of 0.78, 0.70, and 0.52 were observed for restaurants, transportation, and banking, respectively. Output was a strong and significant predictor of overall service quality in each case, with process significant for restaurants and transportation. As in the combined analysis, input was not significant for any of the services.

Our results are consistent with others' suggestions that outputs will be of greatest importance to consumers (Murphy and Ross, 1987; Parasuraman *et al.*, 1991b). However, previous researchers have argued for the importance of *each* of the three dimensions. As a caveat to interpretations of our results, we must note that the three predictor variables were highly intercorrelated

	Predictor variable			$R^2$	$n$
	Input	Process	Output		
<i>Combined analysis</i>				0.73	193
Standard estimate	-0.018**	0.393*	0.538*		
Standard error	0.097	0.090	0.094		
<i>Restaurant</i>				0.78	67
Standardized estimate	-0.082**	0.551*	0.416*		
Standard error	0.142	0.174	0.182		
<i>Banking</i>				0.53	66
Standard estimate	-0.012**	0.151**	0.610*		
Standard error	0.194	0.245	0.206		
<i>Transportation</i>				0.70	60
Standard estimate	0.042**	0.290*	0.635*		
Standard error	0.212	0.145	0.151		

Notes:  
 \*  $p < 0.001$   
 \*\*  $p > 0.100$

Table II. Multiple regression results

## Analysis of factor scores

and that those intercorrelations may have caused the lack of significance of the input variable in the regression equation.

Given this, we wanted to carry out further investigation of the contribution of each dimension to the evaluation process. This investigation was carried out using two different methods. First, we ran the regression analysis both for the combined dataset and for each industry using the factor scores as our independent variables. Second, we conducted a series of focus groups. Study 2 provides a description of these interviews and the results that we obtained.

Factor scores are composite measures representing the contribution of each scale item to each dimension in a factor analysis. Since an orthogonal rotation was used, the use of factor scores keeps the three predictors independent of each other. In this analysis, the overall model explained 71% of the variation in overall service quality. In addition, all three factors were significantly and positively related to overall quality (see Table III).

We repeated the analysis using factor scores for each type of service separately.  $R^2$ s of 0.77, 0.44, and 0.65 were observed for restaurants, transportation, and banking, respectively. Output and process were strong and significant predictors of overall service quality in all three types of service. Input, however, was significant only for the transportation service. The results from these analyses are presented in Table III. The inconsistency between the overall and individual results may be due in part to small sample sizes and resulting low power of the tests in the separate analyses. Overall, these results are accepted as providing support for our framework.

## Focus group interviews

### Study 2

The wide use of systems theory in the marketing and management literatures provided a basis for our expectations that each dimension would contribute significantly to perceptions of service quality. However, as we noted earlier, there have not been previous attempts to verify the framework empirically in this context.

	Input	Predictor variable		$R^2$	$n$
		Process	Output		
<i>Combined analysis</i>				0.71	193
Standard estimate	0.115*	0.547	0.582*		
Standard error	0.069	0.062	0.064		
<i>Restaurant</i>				0.77	67
Standardized estimate	0.019**	0.713*	0.474*		
Standard error	0.083	0.081	0.082		
<i>Banking</i>				0.44	66
Standard estimate	0.021**	0.269*	0.565*		
Standard error	0.146	0.183	0.127		
<i>Transportation</i>				0.65	60
Standard estimate	0.293*	0.458*	0.595*		
Standard error	0.122	0.121	0.127		
<i>Notes:</i>					
* $p < 0.001$					
** $p > 0.100$					

Table III. Multiple regression results (using factor scores)

### Generalizability of the framework

Given the partial support from study 1, we felt it important to study the issue in more depth. In any empirical study, a failure to support expectations can be due either to the framework (theory) or to the research method. Using a different method gives us a better opportunity to identify the reasons for our results. Thus, in order to understand better how consumers perceive service quality, a number of focus group interviews were conducted.

For the focus group interviews, eight groups of undergraduate business students discussed service quality for one of four service classes (restaurants, oil changes, car washes, and air travel). Each service type was discussed by two groups consisting of approximately eight members each. The allocation of the students to the different service types was determined by an initial survey geared to establishing their experience with each service type within the past six months.

The interviews started with the group members sharing some of their recent experiences with that type of service. The main part of the interviews involved a discussion of those things each member perceived as being important in evaluating quality in that particular service type.

To facilitate the discussion, group moderators recorded main ideas on a blackboard. In addition, each group's discussion was tape recorded. Following the discussions, tapes were transcribed. Each individual idea or phrase from the tapes was listed, but items deemed by the authors to be clearly redundant were retained only once.

Analysis of the focus group output involved a ninth group, composed of three doctoral students in business. The doctoral students were given a background in general systems theory, and were asked to classify the focus-group generated items individually and then to discuss the fit of the items to the framework.

Some comments produced by the focus group members were felt by the judges not to reflect quality issues (e.g. "I don't like drive-thru carwashes because I get claustrophobic"). The majority (83%) of the items, however, were classified as input, process, or output by at least two out of the three judges.

Of those items felt to represent elements of quality, 39% were classified in the input category, 45% were classified as process, and 16% were considered to represent outputs. Thus, the results from the focus groups were considered to support the inclusion of the input dimension in service quality evaluation and to provide additional evidence for the systems framework.

### Managerial implications and recommendations

This article describes a general systems approach to measuring consumers' service perceptions. Support for such a conceptualization of service quality is provided both in the literature and by our empirical research. Our focus-group interviews demonstrated that service consumers consider aspects of service inputs, processes, and outputs when making quality evaluations. The survey portion of our research showed that these dimensions together explain a substantial portion of the variation in overall quality perceptions.

### Broad view of the organization

In addition, by studying six different services, we were able to show a degree of generalizability for the framework.

The need for a theoretically sound and generalizable measuring system in service industries is immense. Managers are often forced to use quality measures which are appropriate for rating product quality but not service quality, or that lack both conceptual bases and empirical generalizability. This can result in faulty analyses which, in turn, may lead to poor decision making. A more appropriate measuring system will help service managers develop quality standards which more accurately represent the activities that result in the provision of the service. A general systems approach suggests that such quality standards should be established for the input, process, and output elements of service production.

Schoderbek *et al.* (1990) identified a number of potential benefits of systems thinking to the managers of organizations. Such thinking has at least four benefits; it:

- (1) frees the manager from taking a narrow functional viewpoint of a task and helps him/her identify subsystems that cut across functional areas;
- (2) permits the manager to relate his or her goals to the overall organizational goals;
- (3) permits the organization to structure the different subsystems in a manner consistent with the overall system's goals; and
- (4) allows for evaluations of both the overall system's and the subsystem's effectiveness.

While we have focussed on the overall service production system, the concepts can easily be adapted to address subsystems such as employee training systems or complaint resolution systems.

### Specific areas for improvement

In addition to facilitating a broad view of the organization, identifying multiple dimensions related to customer perceptions of a service can be helpful for identifying specific areas in need of improvement. On the input side, more accurate quality measurement will enable firms to establish the quality level of the inputs currently being used to provide service to their customers. These inputs include atmospherics and the quality and appropriateness of equipment. Measuring consumers' perceptions of these elements will enable the firm to understand how much investment is needed in the service environment.

Inputs also include the type and quantity of training currently provided for new service employees. For example, training in customer service can be either formal or informal. Knowing the current level of quality the company is achieving by using the informal, on-the-job, training approach will enable them to adjust the mix of training they are providing.

Also, by understanding overall service production, the firm will be able to determine whether it should upgrade a job position from an entry level to a higher management position requiring candidates to be more experienced in customer service before they are hired.

## Measuring the output aspect

Measuring the process components of a firm's service system (e.g. the level of service provided, the quality of employee-customer interaction) will enable management to determine how much investment is needed to maintain or improve the service experience. For example, a key element affecting the process component is the reward system a company uses to stimulate its employees to be service oriented. Reward systems may include employee of the year programs, management awards for outstanding service employees, monetary bonus programs based on service performance, etc. By reviewing process quality on a regular basis, a company can make better judgments as to when to update or replace service incentive programs.

Measuring the output aspect of service programs enables a company to determine what has been the return from the investments it has made in service production. The measuring devices used here include customer service surveys, focus group assessments, and direct one-to-one interviews with customers. These output measures enable a company to focus in on the areas where it has been successful and where it has failed in customer service. For example, in the health-care industry many hospitals frequently interview discharged patients regarding the quality of service they received while patients in the hospital. This enables the individual hospitals to pinpoint which departments in the hospital have failed and which ones have excelled. Based on this information corrections can be made and rewards given out.

Although the notion of feedback does not enter our model of service quality measurement, it is inextricably linked to the systems approach to management. Feedback from customer perceptions can affect decisions to adjust certain aspects of each dimension (input, process, and output). For example, if a service quality survey showed that customers perceive input quality to be poor while the other two dimensions are rated highly, then building input quality should be the main concern of the organization. In addition, feedback from employees is an important element in continuous improvement of service production.

## Operational quality service strategies

By understanding the dynamics involved in high-quality service processes, managers will be able to develop service plans which contain realistic objectives, adequate budgets and achievable outcomes for their firms. Their plans then can be used to develop operational quality service strategies that produce returns for the organizations. The service plans can be short, medium, or long term in perspective and contain the ingredients and resources necessary to redress any of the problems pinpointed in the measurement process.

Input, process, and output factors should be contained in the service plan. Often, service plans are not developed by companies on an annual basis. Any planning that is done is cursory in nature and short term in scope. Measuring service quality on a regular basis will encourage firms to pay closer attention to their service operations.

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**Appendix. Eigenvalues and percentage of variance explained by each factor**

Factor	Eigenvalue	Percentage of variance
1	15.86	54.7
2	1.88	6.5
3	1.52	5.2
4	1.08	3.7
5	0.83	2.9
6	0.79	2.7
7	0.71	2.4
8	0.62	2.1
9	0.58	2.0
10	0.51	1.8
11	0.47	1.6
12	0.42	1.4
13	0.40	1.4
14	0.37	1.3
15	0.35	1.2
16	0.30	1.0
17	0.28	1.0
18	0.25	0.9
19	0.22	0.8
20	0.22	0.7
21	0.21	0.7
22	0.20	0.7
23	0.18	0.6
24	0.16	0.5
25	0.14	0.5
26	0.13	0.4
27	0.12	0.4
28	0.10	0.4
29	0.08	0.3



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