# Using Quality Function Deployment to Improve Reference Services Quality

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## 【ABSTRACT】

Much research has been conducted regarding how reference librarians can evaluate and improve the quality of the answers they provide to users' inquiries. There has been considerably less discussion, however, concerning how to improve the quality of the delivery of those answers, and to upgrade the overall quality of reference services as a whole. Suggestions for improving the quality of service contained within the business literature may be applied to improve library services as well. In this paper the use of Quality Function Deployment (QFD) as a tool for improving reference services quality is explored and an adapted framework referred to as service quality function deployment is proposed.

# INTRODUCTION

University libraries have adopted the philosophy of customer-oriented service to satisfy the varying needs of users. Since reference librarians are the most direct link (and, very often, the only real link) that libraries have with their users, the performance of reference services contributes directly to the quality of overall library services by providing the means for marketability and viability. In this sense, managers have become increasingly concerned about the quality of reference services. The managers clearly perceive that having positive experiences with respect to reference services will encourage students to visit the library frequently to enhance their formal course work and to augment their learning ability. Having similar productive experiences with reference librarians will persuade members of faculty to use library resources to enhance their research quality and to improve their productivity. Furthermore, the satisfied members of faculty will market the library's services to their colleagues and encourage students to use the library's resources. For these reasons, libraries enthusiastically engage in providing high-quality reference services in order to satisfy the communities they serve.

Recent studies related to reference service performance have focused on the measurement of the accuracy of answers to both factual and bibliographic questions[1]. Unfortunately, these unobtrusive reference tests have yielded similar results — a patron's chances of getting the right answer to a reference query in a library are little better than fifty-fifty[2]. Obviously, these results should be unacceptable to a customer-oriented service profession. The managers who are unwilling to accept the 55 percent standards should closely scrutinize the service delivery system to determine the extent to which the issues concerned with improving the quality of reference services are addressed.

The purpose in evaluating reference services is to improve the process of providing accurate, timely, and courteous reference service to library customers[3].

Few studies on quality reference service have defined or identified the critical attributes of quality reference service other than in terms of the accuracy of answers to factual and bibliographic questions. Some researchers question the assumption that accurate answer provision alone is a key indicator of reference performance or service quality[4]. Bicknell also points out that the accuracy of the answers that users receive should be a concern, but accuracy may not be the sole indicator of quality service[5]. By combining some components found in library literature with a business service definition of quality, Aluri identifies four aspects of service interaction in assessing the quality of reference services, namely, user needs and expectations, staff behavior and communication skills, the reference environment, and staff morale and workload.

Many reference studies have assumed that the user's primary need is to receive an accurate answer, but Durrane found that 90 percent of the participants in an unobtrusive study would not ask another question of a staff member who had seemed unfriendly, uninterested or made them feel uncomfortable, even if they had received the correct answer[6]. In this sense, the quality of reference services may be more properly defined in terms of their ability to satisfy the actual needs and expectations of the communities they serve and that librarians interested in quality reference services must design services around what users want, and not what the librarians think they want. The business literature also points out that some peripheral services are more important to customer satisfaction than core services. Gronroos believes that the experienced service is a function of two dimensions : technical quality — what the customer gets as a result of the buyer-seller interactions — and functional quality — how the customer gets it[7]. Although more libraries are realizing the importance of service quality and customer satisfaction, it is not always clear how these goals should be achieved. And there has been little discussion regarding the development of a systematic approach to monitor the interrelated service features of reference services, including not only the technical quality of the end product or the answer, but also functional quality in the process of delivering reference services.

Another important factor causing a library to improve the quality of its reference services is that which libraries refer to as the burnout factor. The current process of reference service delivery may be not very effective because it is not really based on a systematic approach to meeting users' information needs. Every inquiry is processed in a slightly different manner depending on staff, time, and workload. Thus managers find it difficult to ensure that all aspects of users' needs are properly satisfied. The lack of an effective means of prioritizing, coordinating, and integrating all internal resources to productively respond to users' needs will lead to customer dissatisfaction. An analysis of the various quality improvement approaches developed in recent years indicates that the concept of quality by deşign is the most effective means of achieving quality. Furthermore, the difficulties encountered in managing reference service quality may be addressed by focusing on the delivery process itself and employing a technique borrowed from manufacturing referred to as quality function deployment (QFD), which is a design and problem solving philosophy consistent with the principles of quality by design.

# QFD APPLICATIONS TO SERVICES

QFD is a system for designing a product or service, based on customer demands, with the participation of members of all functions of the supplier organization[8]. QFD provides procedures and processes for translating customer requirements into the appropriate technical requirements for each stage of product development and production (i. e., marketing strategies, planning, product design and engineering, prototype evaluation, production process development, production, sales) .[9] QFD is usually further broken down into four phases : (1) design, (2) details (may be referred to as parts), (3) process, and (4) production.[10] Each phase has a matrix consisting of a vertical column of *Whats* and a horizontal row of *Hows*. *Whats* are customer requirements ; *Hows* are ways of achieving them. By use of matrix charts, what means will be used to

accomplish the ends are determined. In iterative steps, the prioritized customer needs are translated into identifiable and measurable product specifications and engineering requirements.

The QFD approach has been used, both formally and informally, in a variety of service industries, including software development[11], retail sales operations[12], health care[13] and universities[14]. Using the example of a bookstore project, Ohfuji *et al.* prove that, even when a company is dealing with such intangibles as services, quality function deployment makes it possible to clarify the plan, to design the services to be offered and to conduct quality control activities[15]. Behara and Chase have adopted the concept of house of quality (the principle tool of QFD) for an auto-service firm which they have referred to as "house of service".[16] In addition to designing quality into a new service process, the QFD approach has been proved to be useful in the redesign of existing services and as a diagnostic tool for continuous quality improvement.

According to the service process matrix proposed by Schmenner[17], most of the service applications mentioned above contribute to the quadrant of "mass service." "Mass service" businesses have a high degree of labor intensity but a rather low degree of interaction and customization. When the degree of interaction and customization is low, attention to physical surroundings is important and standard operating procedures can be instituted safely. As the service takes on a higher degree of interaction and customization (i. e., the professional service quadrant), management must deal with higher costs and more talented labor. Maintaining quality and responding to customer intervention becomes important. Since reference services fit neatly within the quadrant of "professional service", and there exist variations in the managerial challenges of the different service quadrants, the application of quality function deployment to reference services certainly requires some adaptation. Figure 1 displays the modified framework for reference services referred to as service quality function deployment. There are four phases to facilitate communicating service requirements from the

customers to the activities related to quality management in respect of the reference services delivering. The first phase, as usual, is to identify the customer's needs and requirements. The second phase, translated into service terms, is to define the requirements of the service and to design the co-service system — both the individual parts and the whole — so that the right quality is built in from the beginning. The third phase consists of process planning. This is a matter of choosing the co-service process which "best" produces what the customer requires. Phase four involves the planning of the quality management activities. Special attention has been given to translating reference process into quality management activities in order to ensure quality both before and during the service delivery.
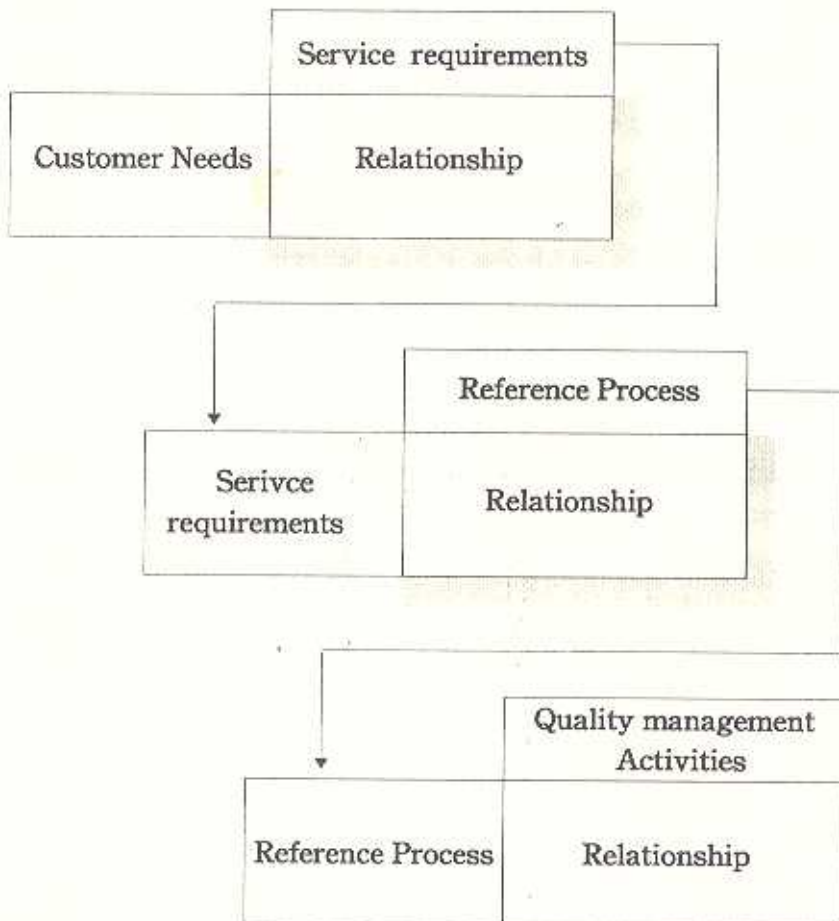


Figur 1 : Serice Quality Function Deployment

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# APPLYING QFD TO REFERENCE SERVICES

## Translating Customer Needs into Service Requirements

The first task is to identify customer needs, which are descriptions in the customers' own words of the benefits they want the reference services to provide. The opinions on the BBS, customer complaints, records of reference interviews, previous user studies, and so on, will all contribute to the list of customer needs. However, as some needs are unspoken or latent, usually more formal customer research is called for via personal interviews and/or focus groups, which give the library a relatively high degree of face-to-face involvement with customers and, ultimately, a more precise understanding of their needs. From Figure 2, the primary customer needs with respect to reference services might be good employees, right answers and nice environment. In order to manage the customer needs, the primary needs need to be structured into a hierarchy. Secondary needs are an elaboration of the primary needs. These needs indicate more specifically what can be done to fulfill the corresponding primary need. In reference services, the primary need for "good employees" might be described further as "good attitude" and "good skills" in serving customers. The need for "right answers" might be elaborated into "accuracy of the answer", "easy to understand" and "easy to access", while "nice environment" may include "easy to identify resources" and "easy-to-use equipment. " In most cases, the secondary needs are further subdivided into very detailed tertiary needs. In this paper, "good attitude" is subdivided into "kind and polite, " "dose not have to wait, " "staff assist users in looking up information , " and "properly dressed".

Each customer need is to be met in terms of professional terminology — that is, service requirements. The requirements of the reference service need to be clearly defined in terms of characteristics that are observable and subject to customer evaluation. For example, the words "kind and polite " express the customer's concept, but librarians need these words translated into their

vocabulary in order to actually build a service delivering standards and quality management activities. In delivering reference services, "kind and polite" may be described in terms of the responsiveness, approachability, attentiveness, courtesy, and professional skills of the librarian. In total, twenty-six service requirements have been identified as means to fulfilling the twenty-three customer needs, as shown in Figure 2. A number of the new management tools of TQM — such as the Affinity Diagram or Tree Diagram — can help with this process and can group these service requirements into different categories. Ultimately, the service requirements of reference services translated from customer needs might be grouped according to answer, process and environment. Among these, the quality of answer might be evaluated according to two perspectives — results and sources. Likewise, the quality of process might be determined by both the willingness and the competence of the librarians, and the quality of environment might take both the physical environment and equipment into consideration.

Customers want their needs to be fulfilled, but some needs are more important than others. Prioritizing customer needs helps to balance the cost of fulfilling a need against the benefit received by the customer. Although all of the customer needs are probably important, QFD provides a systematic method of identifying which needs are more important than others. Importance ratings serve as weighting factors and play a key role in the QFD process. In general, 1 represents low importance and 9 or the highest value high importance. After the importance rating has been assigned, each service requirement's influence on customer needs and the extent of such influence can be judged through the relationship matrix. Relationships are determined by asking if a service requirement can help achieve a customer need. The idea is to specify the strongest relationships while leaving most of the matrix — 60 percent to 70 percent — blank[18]. The relationships within the matrix are depicted according to "strong", "medium", and "weak", and are assigned conventional weightings of "9, " "3, " and "1, " respectively.

Figure 2 clearly shows that the most important customer needs are to have

employees that are kind and polite when serving the customer, and that know customers' real needs ; receiving an accurate, up-to-date, and timely answer ; and having new books in the collection. By translating customer needs into service requirements, the most important requirements of reference services with respect to achieving customer satisfaction are : the availability and accessibility of the material sought ; the professional skills, resources and subject knowledge of the librarian ; and the currency of the collection. Requirements that exhibit a strong relationship in terms of meeting customer needs are important to the customer, and are determined to be critical points that must be deployed or translated into the process of providing reference services in order to ensure that the voice of the customer is accurately heard throughout every action or step in the process of service delivery. Conversely, those requirements that are not as critical in meeting customer needs, or are easily achievable, need not be subjected to a rigorous deployment process. In this case, the five requirements with the lowest scores have been dropped.

## Linking Service Requirements to the Reference Process

Service is basically a process. Therefore, service quality improvement rests, as it must, on identifying and defining processes, and then embedding service requirements into the service delivery process. Defined according to function, reference services can be divided into two categories : direct and indirect. Direct reference services may be broadly defined as any assistance given by library staff to users seeking information and might be categorized into reference encounters, reference interviews, and library instructions, according to the need for professional expertise and job characteristics. Assisting with regard to general information, technical assistance, and looking up information requires no professional knowledge and can be handled by paraprofessionals or technical assistants and, therefore, may be grouped together. Since these three functions usually relate to the first encounter of the customer with the reference services,

# SERVICE REQUIREMENT

Legend:

- ※ = Strong relationship
- ◎ = medium relationship
- ○ = weak relationship

| CUSTOMER NEEDS | | | Importance Rating | Answer – Results: Correctness | Adaptability | Up-to-dateness | Confidentiality | Source: Credibility | Acceptability | Accessibility | Availability | Willingness of the librarian: Responsiveness | Approachability | Attentiveness | Reliability of the librarian | Courtesy of the librarian | Cleanliness of the librarian | Competence: Professional skills | Subject knowledge | Resource knowledge | Confidentiality of the inquiry | Physical surroundings: Approachability of the desk | Currency of collection | Cleanness of the signage | Appropriateness of the layout | Fluency of the traffic flow | Equipment: Legibility of the system | Reliability of the system | Appearance of the equipment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Primary | Secondary | Tertiary | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Good Employees | Good attitude | Kind and polite | 9 | | | | | | | | | ※ | ※◎ | ○ | | ※ | | ◎ | | | | | | | | | ○ | ○ | |
| | | Does not have to wait | 8 | ○ | ○ | | | | | | ◎ | | ◎ | | ○ | | | | | | | | | | ◎ | ○ | ○ | ○ | |
| | | Staff assist users in looking up information | 7 | | | | | | | | | | | ※ | | | ※ | ○ | | | | | | | | | | | | |
| | | Properly dressed | 7 | ○ | ※ | ○ | | | ◎ | | | ※ | ◎ | | ○ | | ※ | ◎ | | ※ | | | | | ◎ | | | | | |
| | Good skills | Knowing user's real need | 9 | ◎ | ◎ | ◎ | | | | | | ◎ | ○ | ◎ | ◎ | ※ | | ※ | | | ○ | | | | | | | | | |
| | | Good language manner | 8 | ※ | ※ | | | | | | | ◎ | ○ | | ※ | ※ | ※ | ※ | ※ | | ○ | | | | | | | | | |
| | | Knowledge of terminology | 8 | ※ | | ◎ | | | | | | ※ | ○ | | ※ | ※ | | ○ | ※ | ※ | ○ | | | | | | | | | |
| | | Has resource knowledge | 8 | | | | | | | | ※ | | | | | | | ○ | ※ | ◎ | | | | | | | | | | |
| | | Has privacy when serving | 7· | | | ◎ | | ※ | | | | | | | | | | ○ | ○ | ○ | ※ | | | | | | | | | |
| Right Answers | Accuracy of the answer | Accurate | 9 | ※ | ◎ | ◎ | | ◎ | ◎ | ※ | ◎ | | | | | | | ◎ | ※ | ※ | | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | |
| | | Up-to-date | 9 | ◎ | ○ | ◎ | | ◎ | ◎ | ※ | ◎ | | | | | | | ◎ | ◎ | ◎ | | | ※ | ※ | ◎ | ◎ | ※ | ※ | |
| | | Credible | 8 | ◎ | | | | ※ | | | | | | | | | | ○ | ○ | ◎ | ※ | | | | | | ○ | ○ | |
| | Easy to understand | Understandable | 8 | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | ◎ | | | | | | | ◎ | ◎ | ※ | | | | ◎ | ◎ | ◎ | ◎ | ◎ | |
| | | Readable | 7 | ※ | ※ | ※ | | ◎ | ○ | ※ | ※ | | | | | | | ○ | ○ | ◎ | | | ※ | ※ | ※ | ※ | ※ | ※ | |
| | Easy to access | Timely | 9 | | | ◎ | | | ○ | ◎ | ◎ | | | | | | | ◎ | ◎ | ※ | | | | ◎ | ◎ | ◎ | | | |
| | | Accessible | 8 | | | | | | ○ | ◎ | ◎ | | | | | | | ◎ | ◎ | | | ◎ | | | | | | | |
| | | Available | 8 | | | | | | ○ | | ※ | | | | | | | ◎ | ○ | | | ◎ | | | | | | | |
| Nice Environment | Easy to identify (Resource) | Has new books | 9 | | | ※ | | | | | ※ | | | | | | | | | | | | | | | | | | |
| | | Signs are easy to see | 8 | | | | | | | ※ | ※ | | | | | | | | | | | ◎ | | ◎ | ◎ | ◎ | ◎ | ◎ | |
| | | Easy to find materials | 8 | | | | | | | | ◎ | | | | | | | | | | | | | ※ | ◎ | ※ | ※ | ※ | |
| | Easy to use (Equipment) | Easy to operate | 8 | | | | | | ◎ | ◎ | ◎ | | | | | | | | | | | ◎ | | | | ◎ | ◎ | ◎ | |
| | | Does not break down | 8 | | | | | | ◎ | ◎ | ◎ | | | | | | | | | | | | | | | | | ◎ | |
| | | Looks modern | 5 | | | | | | | | | | | | | | | | | | | | | | | | ※ | ◎ | ※ |
| **Absolute Score** | | | | 210 | 211 | 198 | 67 | 151 | 206 | 320 | 57 | 98 | 95 | 111 | 85 | 35 | | 319 | 209 | 274 | 52 | 32 | 202 | 96 | 112 | 96 | 165 | 165 | 25 |
| **Relative Score** | | | | 5.8 | 5.8 | 5.5 | 1.8 | 4.2 | 5.7 | 8.9 | 1.6 | 2.7 | 2.6 | 3.1 | 2.4 | 1.0 | | 8.8 | 5.8 | 7.6 | 1.4 | 0.9 | 5.6 | 2.7 | 3.1 | 2.7 | 4.6 | 4.6 | 0.7 |

Figure 2 : Translating Customer Needs into Service Requirements

and sometimes the whole of the library's services, and need to be handled carefully to augment the function of the reference services, they can therefore be labeled as the "reference encounter. " The reference interview may be divided into ready reference, specific search, and research consultation based on the question negotiated, and of course, every interview needs to be evaluated and every unresolved query referred. Library instruction may be divided into bibliographic instruction and database searching that incorporate technologically-advanced tools. While indirect reference services may be summarized as referring to any backofffice operations that make the direct services reality, and might include categories such as interlibrary loans, reserved books management, and reference collection management. The processes of interlibrary loans can be summarized into bibliographic verification and document sending and receiving. The function of reserved books management must comprise the activities of faculty coordination, shelving and maintenance, and circulation. Reference collection management comprises the processes of materials selection, shelving and maintenance, circulation, and developing specialized resources such as vertical and ready reference files. In this paper, the term "reference process" is used to refer to the entire process of reference transactions, both direct and indirect.

From Figure 3, the reference interview can be seen to be the most important process in terms of fulfilling the whole of the service requirements. Here, the requirement that an answer be given is predominantly determined by the processes involving the reference interview. The requirements within the process are chiefly fulfilled by the processes involving both the reference encounter and the reference interview, while the requirements relating to the environment are most critical in the process of the reference encounter. The most important requirement — the availability of the source — may be met in the processes of reference collection management, reserved books management, and the reference interview. The second important requirement — the professional skills of the librarians, is most critical in the processes involving the reference interview and library instruction.

The third important requirement — the resource knowledge of the librarians — is mandatory in the process of the reference interview, library instruction, and interlibrary loans.

## Linking the Reference Process to Quality Management Activities

On the basis of the requirement-process matrix shown in Figure 3, the relationships between the essential process activities have to be analyzed to make high-quality reference services both consistent and continuous. From the customer's point of view, the most immediate evidence of service occurs in the service encounter or the "moment of truth" when the customer interacts with the organization. Therefore, in order to manage the quality of reference services one must firstly examine the forms that a service encounter in reference services may take, and how these forms can be managed.

A customer's encounter with reference services can occur in three basic ways. First, there is the *direct encounter*, where the customer is physically present and interacts directly with the reference staff in the creation of the service. In this instance, the customer has full sensory awareness of the service surroundings, especially the service provider — the reference staff. The second form of encounter is the *indirect encounter*, which involves no interaction with the reference staff, i. e., it is based on self-service. For certain individuals, "do it yourself" would be attractive and preferable. Alternatively, self-service approaches are used to provide service at a time of day when reference staff are not available. The third type of encounter is the *remote encounter*, which involves not only no human interaction but also no customer presence physically. Public use of the on-line catalog and networked database systems can be made readily available through the campus computing network or through dial-up using a personal computer and modem from offices, dormitories, and homes. These customers, too, make up part of the library constituency, and frequently need the help of reference staff.

# REFERENCE PROCESS



**SERVICE REQUIREMENT**

| Primary | Secondary | Tertiary | Importance Rating |
|---------|-----------|----------|-------------------|
| Answer | Results | Correctness | 5.8 |
| | | Adaptability | 5.8 |
| | | Up-to-dateness | 5.5 |
| | Source | Availability | 8.9 |
| | | Accessibility | 5.7 |
| | | Acceptability | 4.2 |
| | | Credibility | 1.9 |
| Process | Willingness of the librarian | Reliability | 3.1 |
| | | Approachability | 2.7 |
| | | Attentiveness | 2.6 |
| | | Courtesy | 2.4 |
| | | Responsiveness | 1.6 |
| | Competence of the librarian | Professional skills | 8.8 |
| | | Resource knowledge | 7.6 |
| | | Subject knowledge | 5.8 |
| | | Confidentiality | 1.4 |
| Environment | Physical surroundings | Currency of collection | 5.6 |
| | | Appropriateness of the layout | 3.1 |
| | | Clearness of the signage | 2.7 |
| | | Fluency of the traffic flow | 2.7 |
| | Equipment | Legibility of the system | 4.6 |
| | | Reliability of the system | 4.6 |

Reference process columns (Direct Service): 1. Reference encounter (1.1 General assistance, 1.2 Technology assistance, 1.3 Looking up materials); 2. Reference interview (2.1 Ready reference, 2.2 Specific search, 2.3 Research consultation, 2.4 Evaluation and referral); 3. Library instruction (3.1 Bibliographic instruction, 3.2 Database searching).

Reference process columns (Indirect Service): 4. Interlibrary loans (4.1 Bibliographic verification, 4.2 Sending & receiving document); 5. Reserved books management (5.1 Faculty coordination, 5.2 Shelving & Maintenance, 5.3 Circulation); 6. Reference collection Management (6.1 Materials selection, 6.2 Shelving & Maintenance, 6.3 Circulation, 6.4 Developing specialized resources).

Absolute Score / Relative Score rows appear at the bottom of the matrix.

Figure3 : Linking Service Requirements to the Reference process

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The service encounter is often recognized as person-to-person interaction. Many reference services, however, are not rendered personally. Therefore, the quality of the reference services encounter is a function of the quality of the total service design, involving not only people, but also technology and system. In other words, there are three interfaces that dictate how reference services are perceived — people, technology, and system. Success in quality improvement comes as a result of the correct balance among these three interfaces, which should be incorporated as outlined below.

**People.** Most customers consider the performance of employees to be the most influential attribute of service quality in service industries. This is especially important in reference services which are characterized by highly human-intensive interaction with customer, and where the behavior and performance of individual employees has a direct impact on the quality of service. Quality reference services may be defined not only as the ability, but also the willingness, of employees to give prompt or timely service. Therefore, the recruitment and selection, education and training, and attitude cultivation of employees, as well as their relations with their supervisors and customers are all critical activities in quality management.

**Technology.** Many services in libraries, reference services in particular, are becoming increasingly based on modern equipment and advanced information technologies. Direct access to on-line services by users through their own personal computers means that certain kinds of inquiry now bypass librarians altogether. This growth in high technology has added new dimensions to reference services, and reference services are now recognized as a high-technology delivery system. Therefore, in order to improve the quality of reference services, the selection of hardware and software, the layout of facilities, the degree of technology substitution and vendor relations are major activities that need to be seriously managed.

**System.** Fundamentally, quality management begins with the design of the service

delivery systems. Technology alone does not make a service. The best-intentioned employee can be prevented from creating satisfactory service if the underlying system's design is poor. According to Juran, 92 percent of the quality defects in manufacturing companies can be attributed to faults in the system.[19] In the service sector, it is estimated that system-related quality defects account for 70-80 percent of quality problems.[20] Because the built-in system faults continually put employees in unpleasant or impossible situations with customers, staff lose their motivation and customer dissatisfaction occurs. In order to deliver quality reference services, the following activities should be thoughtfully engaged in : planning a customer-friendly process that allows the employees to deliver service in the best way, standardizing service to make sure the customer is received consistently, building service recovery to put things right while the customer is still in the service system, assigning the right person to the right job, and smoothing coordination between functions.

From Figure 4, it can be observed that the most critical process in reference services is the reference interview. The quality of the reference interview can be assured by through converging people, technology and system in triangulation. The most critical activities in terms of quality management with respect to the reference interview are employees' attitudes, software selection, and process planning, followed by employee skills training, functional coordination, and job/personnel scheduling. The second most important process in reference services is the reference encounter. Similarly, the quality of the reference encounter can also be ensured by converging people, technology and system, while, technology and system are more important. The most critical activities related to quality management in respect of the reference encounter are facility layout, substitution by technology, process planning, and service recovery. The most important quality management activity related to library instruction is service standardization, followed by employee skills training, software selection, and substitution by technology. The major quality management activities related to reference collection management are developing customer and vendor relations,

service standardization, and functional coordination. In respect of reserved books management, the most important activities related to quality management are supervisor-employee relations and customer relations. As to interlibrary loans, the most important activity related to quality management is service standardization.

# IMPLICATION FOR PRACTICE

The purpose behind reference services is to allow information to flow efficiently from the information source to those who need information. Excellent quality service and customer satisfaction can only be achieved through process improvement. In order to satisfy customer needs as effectively as possible, the reference librarian may define and isolate all processes involved in the delivery systems, and adopt a customer-oriented approach to make sure that every process involved in meeting the customer's request for information is completed satisfactorily. For critical processes that are performance determinants of the services, activities related to quality management can be attached to each activity to help set standards and control the quality of the services.

The most important process in reference services, as shown in Figure 3, occurs in the reference interview with the highest absolute score (953), followed by the reference encounter and reference collection management with equal absolute scores. The improvement of the quality of reference services, therefore, must focus on these key processes, and link the internal measures of quality management to meet the external measures of quality service in terms of customers' needs.

## Reference Interview

Not every reference transaction requires an interview. Some questions are straightforward factual questions to which the appropriate response is simply to present the answer as quickly as possible. With no need for further negotiation,

## Quality Management Activities

**Figure4 : Linking the Reference Process to Quality Management Activites**

| Reference Process | Importance Rating | People | | | | | Technology | | | | | System | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Employee selection | Employee skills training | Employee attitudes | Supervisor-employee relations | Customer relations | Hardware selection | Software selection | Facilities layout | Substitution | Vendor relations | Process planning | Service standardization | Service recovery | Job/personnel scheduling | Functional coordination |
| **Direct Service** — 1. Reference encounter | 2 | | | | | | | | | | | | | | | |
| 1.1 General assistance | 5.2 | ◎ | ○ | ◎ | ○ | ○ | | ○ | | ※ | | ※ | ※ | ※ | ◎ | ○ |
| 1.2 Technology assistance | 5.3 | ※ | ◎ | ◎ | ○ | ○ | ※ | ※ | ※ | ※ | ※ | ※ | ◎ | ※ | ※ | ○ |
| 1.3 Looking up materials | 6.9 | ◎ | ○ | ◎ | ○ | ○ | ○ | ◎ | ※ | ◎ | | ◎ | ○ | ◎ | ◎ | |
| 2. Reference interview | 1 | | | | | | | | | | | | | | | |
| 2.1 Ready reference | 9.0 | ◎ | ※ | ※ | ○ | ○ | ○ | ※ | ◎ | ◎ | ○ | ※ | ◎ | ◎ | ◎ | ※ |
| 2.2 Specific search | 9.0 | ◎ | ◎ | ※ | ◎ | ◎ | ○ | ※ | | ※ | ※ | ※ | ○ | ◎ | ※ | ※ |
| 2.3 Research consultation | 8.6 | ※ | ※ | ※ | ◎ | ◎ | ○ | ※ | | | ◎ | ※ | ○ | ◎ | ※ | ◎ |
| 2.4 Evaluation and referal | 8.3 | ◎ | ◎ | ◎ | ※ | ◎ | | ○ | | | | ◎ | ○ | ○ | | ◎ |
| 3. Library instruction | 3 | | | | | | | | | | | | | | | |
| 3.1 Bibliographic instruction | 5.8 | ◎ | ◎ | ○ | | ○ | ○ | ◎ | ◎ | ※ | ◎ | ◎ | ※ | ○ | ◎ | ○ |
| 3.2 Database searching | 5.5 | ◎ | ※ | ○ | | ○ | ◎ | ※ | | ◎ | ◎ | ◎ | ※ | ○ | ◎ | |
| 4. Interlibrary loans | 5 | | | | | | | | | | | | | | | |
| 4.1 Bibliographic verification | 4.1 | | ◎ | | | | | ◎ | ◎ | ◎ | ◎ | ○ | ◎ | ○ | | |
| 4.2 Sending & receiving document | 4.7 | | | ○ | | | | ※ | ◎ | ◎ | | ○ | ◎ | ○ | | |
| **Indirect Service** — 5. Reserved books management | 4 | | | | | | | | | | | | | | | |
| 5.1 Faculty coordination | 4.2 | ◎ | ◎ | ◎ | ※ | ※ | | ◎ | | | ◎ | ◎ | ○ | ◎ | ◎ | ◎ |
| 5.2 Shelving & Maintenance | 3.2 | | | | | | | | ◎ | ○ | | | ◎ | | | ○ |
| 5.3 Circulation | 3.0 | | | ○ | ○ | | ○ | ○ | ◎ | ◎ | | ○ | ○ | ○ | | ○ |
| 6. Reference collection Management | 2 | | | | | | | | | | | | | | | |
| 6.1 Materials selection | 5.5 | ◎ | ◎ | | | | | | | | ※ | | ○ | | ◎ | ○ |
| 6.2 Shelving & Maintenance | 3.2 | | | | | | | | ◎ | ◎ | | ◎ | ◎ | | | ※ |
| 6.3 Circulation | 3.0 | | | ○ | ○ | | ○ | ○ | ◎ | ◎ | | | ○ | ○ | | |
| 6.4 Developing specialized resources | 5.7 | ○ | ○ | ※ | ※ | ※ | | ○ | | ◎ | | ◎ | ○ | | ◎ | |
| **Absolute Score** | | 248 | 260 | 245 | 148 | 165 | 92.4 | 257 | 142 | 176 | 163 | 292 | 237 | 200 | 258 | 191 |
| **Relative Score (Rank)** | | 5 | 2 | 6 | 13 | 11 | 15 | 4 | 14 | 10 | 12 | 1 | 7 | 8 | 3 | 9 |

these inquiries are referred to as ready reference. There are two essential differences between the specific search and the ready-reference questions. Ready-reference queries can usually be answered with data, normally in the form of short answers from reference books. Specific search answers almost always take the form of giving the user a document, e. g., a list of citations, a book, or a report. [21] Ready-reference and specific search queries on the one hand presuppose specific answers and specific sources, which, with practice, the librarian is usually able to locate quickly. Research consultation or research advisory assistance on the other hand can be defined as interviewing a client in a systematic way to analyze the client's information needs or research problems, relating it to the whole array of potential information resources, devising and explaining a research strategy, and suggesting or assisting in identifying the most promising reference tools and other resources with which to begin the research process. [22] But not all answers provided by the librarians can satisfy customers' needs. The answer delivered, therefore, must be evaluated, and unsatisfied customers must be referred to other staff, experts, or to the documentation and instructions available, and, sometimes, even to outside organizations.

The reference interview, and research consultation in particular, is the kind of reference service which most of all requires knowledge of the subject and resources, as well as the professional skills of the professional librarian. Other requirements in determining the degree of service satisfaction in relation to the reference interview include the adaptability of the results, the acceptability of the source, and the reliability and attentiveness of the librarian. Since the quality of the reference interview is largely determined by the librarians who deliver the service, in order to improve the quality of the reference interview, the activities of quality management must focus mainly on the people, with system and technology as facilitators. With regard to people, the critical activities of quality management are employee selection, employee skills training, employee attitudes, supervisor-employee relations, and customer relations. Software selection and vendor relations are the most important activities related to the technology dimension.

As to the system dimension, the most important activities of quality management are process planning, job/personnel scheduling, and functional coordination. A detailed elaboration of these items is given below.

**Employee Selection.** In the reference interview, reference librarians are directly concerned with servicing the customer. Since there is no buffer between the customer and the surly or shoddy librarian, identifying people with the appropriate attitudes and interpersonal skills can result in hiring reference librarians with the natural instincts needed to serve customers well. Through questions and negotiation, a reference librarian can clarify the user's real needs. To be effective, the reference librarian must use the user's language to communicate, knowing that terminology can smooth the communication process and increase the relationship with the customer. Therefore, subject background is critical to the professional reference librarian in a reference interview. Taken together, the ideal candidate for a reference interview position, especially a research consultation position, will be well educated in one or more areas other than librarianship, and will have high service ideal and strong internal motivation.

**Employee Skills Training.** Clearly, customers expect a great deal from the high-contact reference librarians, and therefore the librarians must demonstrate both managerial and marketing abilities in addition to the technical skills necessary to deliver the service. Important attributes that can be considered to be critical in the reference interview are computer literacy, research competence, service orientation, and critical thinking.

Computer literacy has become a much more critical factor in reference services, since by using a variety of search software, reference librarians may search for ready reference information at their desks, verify or correct citations, compile research bibliographies for users, or locate materials in other libraries through the use of database systems, or OPACs on the Internet. In order to provide research advisory services, the reference librarians must be equipped with

research competence. Experience in conducting independent research or special projects is essential for guiding customers. Wesley makes a strong argument for regarding critical thinking as the most valuable skill a reference librarian can have.[23] The customers require that the answer provided must be the right one and must be tailored to their needs. Reference librarians who have acquired the conceptual and evaluative skills involved in critical thinking are able to think creatively, adapt to new environments, integrate a broad range of experiences into problem solving, develop innovative approaches to customers' inquiries, and are most likely to satisfy the ultimate needs of customers. Since customer satisfaction is the primary objective of reference services, reference librarians need to be more "people-and service-oriented" when interviewing customers. A study by Whitlach revealed that service orientation is very important in reference success ; courtesy, helpfulness, and interest were highly valued by users and colored their perceptions of outcomes.[24]

**Employee Attitudes.** In addition to general communication skills, reference librarians who are skilled at interpreting nonverbal communications have a higher degree of customer satisfaction and create repeat customers more effectively than do those who are not so skilled. More specifically, those employees who are high self-monitors (that is, people who adjust their behavior in the context of a social situation[25]) — as well as good nonverbal perceivers showed the highest levels of customer satisfaction. Self-monitored librarians not only pick up nonverbal cues from customers but also adjust their own behavior (smiling, laughing, frowning and so on at the "right times") in response to these cues.

**Supervisor-Employee Relations.** Research indicates that when employees report positively on how well they are trained, supervised, career-counseled, and so on, customers favorably view the quality of service received.[26] In other words, the employees' experience with their service surroundings affects the customers' service experience. Therefore, library managers should treat

reference employees as "internal customers, " i. e. as individuals deserving the same courteous treatment that management wants the library's customers to receive. The way to create satisfied customers is to create satisfied employees. The satisfaction that results strengthens the willingness and ability to produce a service that in turn ensures the customer's satisfaction.

**Customer Relations.** In a reference interview, customers often take part in the production of the output by doing something themselves or by helping the reference librarian, that is, by acting as a "coproducer. " Common examples of coproduction are carrying key papers to the reference librarian offering a research advisory service, identifying terminology in a specific search, and evaluating source credibility in a ready reference search. Greater customer participation in service operations fosters customer commitment and a willingness to accept some of the responsibility, so that customers have more realistic expectations of the outcomes and greater satisfaction with the results.

The library that aspires to give customers exactly what they want at the right time must look to build a learning relationship with each one. A learning relationship is an ongoing connection that develops further as the librarian and the customer interact with each other, collaborating to meet the customer's needs over time. [27] The reference interview is the best chance to develop a learning relationship with customers, because one-to-one communications elicit information from each customer about his or her specific needs and preferences.

**Software Selection.** There are many sophisticated, complex, and highly useful software systems available for reference services, including CD-ROM databases, on-line access databases, and local mounted database systems. Effectively selected software can facilitate the reference librarians in providing the answer or information with more comprehensiveness, timeliness and accuracy.

**Process Planning.** Quality defects are often caused by wrongly-designed processes

in the delivery systems. Because reference interviews are always produced and processed on the spot,　neither inspection of service to determine which ones meet specifications nor sorting good services from bad have ever been an effective approach for quality management. Therefore,　a concerted effort must be put into the design and control of the process delivering the service. This shift in emphasis is very much in tune with the theme of "doing it right the first time" in the manufacturing sector. The library must give the customer a favorable initial impression,　and must also make sure that the last memories of customer contact are good.

**Job/Personnel Scheduling.** The effectiveness of service delivery systems are characterized by a good "fit" between the special needs and motivations of particular employee target groups and the special features of the job. Utilizing employees means arranging their work to make them both productive and motivated. High- and low-contact jobs call for different sets of tasks. In the high customer-contact direct services,　such as reference interviews,　the employee must interact with the customer,　the technology and the system. High-contact reference librarians need interpersonal skills and knowledge of all of the systems under which the library operates,　not only knowledge of the reference departments. Where motivation is lacking and people are not developing,　it is always worth investigating whether jobs and roles can be redesigned to make them more interesting and enriching to the librarians.

**Functional Coordination.** Direct services deal with front-office operations,　are conducted in the presence of the customer and must cope with the input uncertainty of customer contact and participation. Indirect services belong to back-office operations which can realize the full potential of system rationality and efficiency. Needless to say,　successful reference interviews require close coordination between the direct and indirect functions.

In fact,　departments other than reference services also make a significant contribution in terms of creating positive encounter experiences with regard

to reference services. Because the operations in a library are interwoven, reference librarians do not work in isolation, but rather play an intermediary role in marketing to the customer the product produced by the technical librarians. By contrast, in order to provide accurate and current sources of information to customers, reference librarians depend on technical librarians to rush order and to rush the processing of reference materials and books that are to be reserved. Overall, the customer's success in a reference interview is the results of the perfect coordination of all functions in the library.

## Reference Encounter

The reference encounters handle three broad types of questions, namely, general information, technical assistance, and looking up materials. The general information staff serves as a command post for all types of library services. For instance, directional or procedural questions are answered, responses to users' inquiries about services are made available, service policy interpretations are received, and arrangements for formalized instruction sessions and library tours are scheduled. Increased access to OPACs and electronic database systems, either offered through the OPAC or in CD-ROM format, has increased the amount of traffic at the reference desk, and generated a great need for technical assistance. The main responsibilities of technical assistants include one-on-one instruction or assistance with the online catalogs, CD-ROMs, Internet or other electronic resources, and hardware trouble-shooting. Another kind of assistance occurs when the customer fails to locate the reference collection, or to find an answer using the specific information resources available in the reference collection.

Assisting at this level requires no specialized library knowledge. The service requirements emphasize approachability, a courteous attitude, and responsiveness. Among these, approachability is the most critical service requirement that the reference encounter needs to meet, although Collines finds it to be a key attribute that rarely receives consideration in the training of reference staff [28]. Obviously,

if the person responsible for providing the service is not approachable, few customers may avail themselves of the opportunity to find out how good the service might be. Because the reference encounter is a period of time during which the customer interacts firstly and directly with the staff, and usually nonprofessional staff, the attitude and demeanor of the staff require particular attention. The staff responsible for the reference encounter need to be responsive and courteous, and to be equipped with resource knowledge. Besides, the physical surroundings and equipment are the service requirements and should not be neglected. Furthermore, the answers given must be correct. All these customer needs can be fulfilled by incorporating the following quality management activities in terms of people, technology and system.

**Employee Selection.** Libraries often select reference-encounter employees on a seemingly random basis or merely on the basis of their perceived ability to perform the technical requirements of the job. Although assisting in a reference encounter requires no professional knowledge, interpersonal skills are extremely critical in successful encounter service. In order to improve the quality of reference encounters, the selection of employees should take interpersonal skills into serious account.

**Hardware Selection.** The technologies selected must actively support employee efforts to render service dependably, accurately and consistently. As the customer will increasingly come to expect convenience, as well as the speed, accuracy and dependability that computer technology has made possible, the library must be equipped to provide such services. Technical assistants are employed in an attempt to cope with malfunctions in a bewildering array of databases, software, and hardware. The training and troubleshooting workload related to electronic systems can be decreased significantly by means of properly selected and maintained technology using customer-oriented software.

**Software Selection.** With the proliferation of information technologies, end-

user searching increases dramatically. The users enter these electronic systems and must navigate through them in order to reach appointed goals by themselves. Issues, such as software design to determine how well the user copes with the system, how legible or understandable the system is, and how clear are the aids provided to lead one through the system, are very important. The poor legibility of the software, increases the need for technical assistance at the reference encounter and leads to a greater number of requests for mediated searches at reference interviews.

**Facility layout.** The layout problem is concerned with the determination of the most nearly optimal arrangement of the physical components of the service system within time, cost, and technology constraints.[29] Impediments in the layout can result in real and goal frustration for the customer which take the form of delays. Negative effects may also accrue to employees, who may feel frustrated performing other critical functions, because of time spent answering questions from confused customers and providing basic directions and instructions.

A process-oriented layout is very efficient when dealing with reference services customers, a typical situation being one in which each customer has a different need. A continuous inflow of customers, each with his or her own request, requires routing through the information desk, OPAC station, reference desk, reference collection, general collection, and so on. The equipment required to serve a customer is arranged in a sequence according to the steps in the service process. This tailoring of the process allows the customer to be served on a continuous basis without interruption. Transit lines that move in straight paths are easier to follow than those with irregular paths. In facility layout planning, the most common tactic is to arrange service points in the most convenient locations.

**Substitution.** Effective use of technology is an important factor in service consistency. The labor intensity typical of reference encounter delivery

systems makes it difficult to limit the variability in output and to exercise quality control. Substituting technology and systems for people is a feasible solution. To relieve the workload of the reference encounter is to reduce personalized staff involvement by developing self-guided orientations incorporated in OPAC or designing a stand-alone computer-assisted instruction system. It is widely recognized that instruction, if it is to be effective, must be given at the time of need, so that, with the computer-assisted instruction system, the customers can learn at their most convenient time and pace. Furthermore, if the inquiries regarding service policies, hours, directions, etc., can be reduced, ultimately, the reference encounter for general/ directional assistance may be removed.

## Reference Collection Management

An effective reference service must be supported by materials that are currently and easily obtainable by customers. The expert advice of the reference librarians is of little value when the materials containing the information cannot be located. Reference collection management refers to identifying, collecting, evaluating and organizing the information resources and developing and providing databases. The customers require that the answers provided are accurate and up-to-date. Likewise, the information collected in the library must be accurate. For reference tools to be effective, the information they contain must be up-to-date. Rettig has reminded us that users who suffer harm from outdated information will abandon libraries, and, therefore, reference librarians should not wait to act until after the invisible potential for harm from dated books is actualized in unimagined ways. [30] In addition to the results being up-to-date, the accuracy of the results and the credibility of the source are the other two important service requirements concerned with reference collection management. Hernon and Altman suggest that librarians include misconduct as one component in the framework of service quality to alert the customer about discredited or tainted research. [31] In order to ensure the quality of reference collection, there are three

activities related to quality management which need to be engaged in, namely, vendor relations, service standardization, and functional coordination.

**Vendor Relations.** Technology alone does not constitute service. A service is not delivered until its value is recognized by the customer. The university library has neither the hardware, software, nor technical resources to launch and sustain an electronic information service alone. The reference service must involve a number of constituencies. They must have access to database systems, local publishers, CD-ROM vendors, software engineers and hardware technologists to make the electronic information service a reality. Rapid developments in hardware, software, text retrieval tools, interfaces, and machine-readable sources of information have combined to alter the library world irrevocably.[32] The library, therefore, has no choice but to form partnerships with publishers, computer centers or other organizations that have these needed resources. The past decade of incredible technological advances has spawned great numbers of new products that have been pushed on to the market rather than being strategically designed according to market needs.[33] The reference librarians who are skilled in information retrieval needs and writing/editing requirements, and who will avail themselves of the hardware/software solutions prepared by the vendors, will in the end arrive at a fairly strong consensus regarding the potential for product success. With such a partnership, the reference interview will be effectively responsive to customers' needs.

**Service Standardization.** Management can expect great performance variability when employees invent their own jobs ; some people are simply better at selected tasks than others. Performance consistency is enhanced by service standardization. That is, a method or techniques for delivering specific services is designed, and tested for reliability, and employees are trained to use it.

Service standardization is especially important where indirect services are involved. This is because the indirect services staff are usually supported by

student assistants or nonprofessional staff who have limited professional skills, and also because the jobs concerned with reference collection management are characteristically routine.

**Functional Coordination.** The direct service librarians can hear the opinions of the customers, while the staff responsible for reference collection management are located in the back-office without direct links with customers. Only by means of fluid coordination among functions can it be ensured that the resources needed by the customer will be acquired by the library in time. Furthermore, where there is smooth coordination among departments, the resources acquired by the reference department will be received by the customers in time.

## Conclusion

The power of QFD lies in its founding philosophy : the voice of the customer will drive everything an organization does throughout the process of developing and delivering products and services[34]. Quality cannot be determined autonomously by the manager of the library's librarians, but only by the customer. Therefore, customer expectations and needs must be regarded as critical throughout the whole process of service planning and delivering. The strength of the method is that it systematically translates the "voice of the customer" into service requirements, processes, and quality management activities. The framework presented in this paper can be customized to reflect the requirements of individual libraries, and will help libraries highlight where resources and efforts should be expended and, just as importantly, where time and money should not be invested, in an objective and integrative way.

Managers can also employ quality function deployment to assist in the decision-making activities associated with strategy setting, the allocation of resources, the integration of service functions and the evaluation of performance overall.

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