Information Technology's Use in Measuring Service Quality: Case Study at Total System Services, Inc.

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ABSTRACT
Total Quality Management is becoming increasingly important in the service industry. This paper reports the use of information technology to implement a quality information system to measure service quality in Total System Services, Inc. (TSYS), a credit card processing company. The effectiveness of developing the quality information systems is evaluated based on the four major elements used in the Malcolm Baldrige National Quality Award measures. We found that quality information systems have changed the focus of problem solving at TSYS from a reactive to a proactive mode. The analysis also leads to identification of strategies that could leverage investment in IT to improve the quality of service in a company.

PROBLEM AND RELEVANCE
The service sector, once second to manufacturing, now contributes more to the gross national product (GNP) than does manufacturing (Hackett, 1990). During the past decade, service sector companies spent $680 billion on information technology and received only a half a percentage point of productivity growth a year (Balasubramanian, 1993). Quality management is a strategic goal that is important to all industries and is receiving increased attention. Total quality management (TQM) primarily focuses on customer satisfaction, within a corporate culture that seeks continuous improvement of all processes and systems. One aspect of the continuous improvements focus concerns itself with the measurement of indicators that aid in identifying problem areas before and after the product or service reaches the consumer. Until the late 1980s, many managers in the service sector believed that services were intangible, and therefore not measurable (Schonberger, 1992). Most service companies could only track their customers' perceptions through customer complaints. This is a reactive means of quality management and therefore does not allow for proactive problem solving to avoid customer complaints.

Although information technology (IT) has been a major factor in the success of the service sector in offering widespread services using shared databases and global networks, its use in measuring quality is not well documented. Service companies, such as banks, insurance companies, credit card processors, etc., are critically dependent on IT to offer superior services to their customers. However, recent competitive pressures are forcing service companies to cut costs and to emphasize quality (Berkeley and Gupta, 1993). Information systems departments are being increasingly scrutinized for their ability to meet corporate quality goals. Can IT, the backbone of many service industries, go beyond operational systems and proactively measure quality dimensions and thus help solve problems before they reach the customer? We had an opportunity to observe the implementation of quality information systems by Total System Services (TSYS) for a client, AT&T Universal Card Services (UCS). We report on TSYS's use of IT to measure service quality and meet customer expectations. We use the major elements of the Malcolm Baldrige National Quality Award in order to understand and relate the use of IT to measure quality.
leads to findings that could be used by managers of other service companies.

**EQUATION OF QUALITY INFORMATION SYSTEMS AT TSYS**

TSYS is a bankcard and private label card processing company based in Columbus, Georgia, which provides card-issuing institutions with a comprehensive on-line system of data processing services marketed as THE TOTAL SYSTEM™ (TS1 and now TS2). With a nationwide data communications network, TSYS offers customers a full range of services, from credit card production and statement preparation to customer service support. The company processes Visa, MasterCard, and diner's Club, as well as private label, debit, and corporate cards.

**Informal Quality Information System**

When TSYS was formed in 1983, it handled the credit card accounts of the parent organization, Columbus Bank and Trust Company and a few other banks across the country. At that time, TSYS had an employee base of about 120 people. Service quality was monitored by customer service representatives who called each customer bank daily. Additionally, the banks were free to call Rick Usery, Chairman and CEO, or Phil Tomlinson, President, directly if problems arose. The two executives gathered the service quality level by the number of calls received regarding customer complaints.

**Formal Quality Information Systems**

TSYS changed its method of quality management and control after it obtained the rights to process AT&T-Universal Card (UCS) credit cards in 1990. Customer representatives at UCS's offices in Jacksonville, Florida access real-time information from computers in Columbus, Georgia. All information processing is done by TSYS at its facilities in Columbus, Georgia. TSYS, as part of the agreement with UCS, had to adopt formal service quality monitoring and measurement methods. Quality management had grown more important to TSYS as it had expanded to employ 1,500 people. TSYS and UCS measure a set of quality indicators daily that they view as critical success factors. These quality indicators are related to the daily processing of customer credit card accounts. Not meeting the standard of one of these indicators means not meeting the daily quality goals of the company. Of the ten indicators that TSYS shared with UCS daily in 1993, eight measure the overall availability of the system and two measure accuracy. Availability measures are computed for subsystems such as authorizations, collection systems, cardholder systems, credit bureau interface, and others. Accuracy is measured for production problem resolution and training systems.

The ten quality indicators are computed from over 340 function codes. These function codes present the information that is requested on-line by the customer service representatives of UCS. Of the 340 function codes, about 75 are retrieved extensively. For example, a typical function code would be the access and retrieval of a customer's current balance. The TS1 continually measures the number of times these codes are accessed, the success of the access, and whether the response was accurate. At the end of each day, the quality of the ten indicators is computed in terms of a percentage.

Standards with UCS have been set so that the systems had to be available 99.5 percent of the time. This essentially works out to a maximum of seven minutes outage a day. For example, Cardholder System Availability is an indicator composed of 306 function codes. For this indicator to meet the daily quality standard, none of the function codes could be unavailable for more than seven minutes a day. Some of these function codes are accessed as much as 190,000 times a day. Others may not be accessed for a month.

A final daily quality index is computed on the average value of the indicators. TSYS has set a standard that its daily quality index should be higher than 96.0 percent each day, implying that each indicator must be met. For example, if even one indicator is missed, the daily quality index will be 90 percent. The information technologies at TSYS help identify and document problems in meeting the objectives. If a function code is unavailable for more than the seven-minute maximum, the system automatically generates trouble tickets before any "human monitoring" system is aware that a problem occurred.

TSYS and UCS executives meet each morning (face-to-face or audio teleconferencing) to discuss the trouble tickets and the value of the daily indicators. They add names of responsible persons and report cause to each trouble ticket. They also generate action plans daily that list the status of active trouble tickets, actions taken to close the tickets, and actions required for final resolution of the problems. The trouble tickets and action plans are available on-line to em-

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2In response to the UCS operational demands, TSYS created a position of Senior Vice President/AT&T Relations and hired Stanley Pipes to fill that position.
3Currently TSYS serves 114 card issuers in 36 states, Puerto Rico, and Canada which represent 35.5 million cardholders and 250 merchant accounts.
4Accuracy is defined by TSYS as the correctness of the information appearing on a screen, when that screen is accessed.
5The measurement is based on all queries made to the system, not on a sample of the queries.
ployees working at TSYS or UCS. The trouble tickets be-
come an automatic feedback system to the daily morning
meeting, hence problems are addressed within 24 hours of
their occurrence. Pipes states:

Each trouble ticket has to be closed. To close one,
you have to explain what happened and why it happened.
The next step we take is to file an action plan to prevent it
from happening again. We then put additional controls in
place.

Thus, the information systems allow TSYS to be aware
of a problem and usually fix it before a customer brings the
problem to their attention.

Application of Quality IS to Other Divisions of TSYS

After the development and implementation of quality
measures to track the UCS account, TSYS began exploring
other areas of its business to apply the same techniques.
During the past two years, TSYS has started measuring the
quality indicators of many of its own internal operations. A
central quality group works with each division to create new
quality measures. The operations of each division are mea-
sured using these indicators and are reported to management
and to other employees on a daily basis.

We interviewed various levels of executives and em-
ployees at TSYS in order to understand the use of IT to
measure service quality. Our subjective evaluation was very
favorable and we wanted to identify the elements that led to
the use of IT to measure quality in TSYS. We used the major
elements of the Malcolm Baldrige Award Criteria for this
evaluation.

IT'S USE IN MEASURING QUALITY

Malcolm Baldrige criteria consists of four basic ele-
ments that embody a set of core values and concepts that
are critical in enhancing quality in an organization. These ele-
ments are the driver, the system, measures of progress and
the goal. The driver refers to senior executive leadership
and their creation of the values, goals, and systems, and their
guidance in the sustained pursuit of customer value and
company performance. The system encompasses the set of
well-designed and well-defined processes used by the firm
for satisfying performance, quality, and customer require-
ments. Measures of progress produce a results-oriented
foundation for directing actions required to deliver continu-
antly improving company performance and customer value.
The goal is the primary objective of the quality process, that
is to deliver continually improving value to the customer
(Award Criteria, 1993). We will discuss below how the use
of the computer-based formal IS (TS’, TS’), telecommuni-
cations networks, and newly created quality information
systems are used to meet the quality expectations of each
basic element of the Malcolm Baldrige Criteria.

How IT Is Used in the Driver Element

The driver element specifies that senior executives cre-
te the values, goals, and systems for the organization, and
guide the sustained pursuit of customer value and company
performance improvement (Award Criteria, 1993). TSYS’s
executive management are committed to the concept of TQM
and have made major efforts to spread TQM concepts in the
company. Phil Tomlinson, President of TSYS, states that:

It is our objective to create an environment at Total
Systems where continuous improvement can flourish and
we can exceed customer expectations every day.

A major step in achieving this objective is through a
monthly meeting of the company’s top executives from each
functional area. Quality indicators are computed for each
measure that has been devised and a daily quality index is
computed for the company based on these. The executives
review a binder that has detailed statistics measuring the
performance of each functional area. These meetings require
each executive to explain the impact his or her part of the
organization has on the company’s efforts toward meeting
the customer needs.

Through the daily quality index, senior executives have
a microscopic view of those areas of the company that have a
direct impact on the strategic goal of client satisfaction. This
allows the executives to continually evaluate that division’s
progress toward the goal until the objectives are met. As the
business operations change, and the position of the microscope
shifts to other divisions and processes. Without such infor-
mation, the leadership of TSYS could not focus attentions on
evaluation of progress toward the goal. Rich Ussery, CHO
and Chairman of the Board of TSYS, states:

We have changed the way our management does
business. We have become more sophisticated in using
measurements on a daily basis in order to improve quality.

The expectations of the senior managers on tracking
quality measurements has been satisfied by the development
of information systems and telecommunications networks in
TSYS.

How IT is Used in the System Element

The system element is the operational IS (IT²) and tele-
communication networks that are in place in TSYS to meet
customer needs. They encompass the set of processes used
by the firm for satisfying performance, quality, and customer
requirements and provide a flexible set of services to meet
the differing needs of the clients of TSYS. The IS is structured
as modules—each module relates to a different area of
bankcard service, such as authorizations, collections, report-

Journal of Information Technology Management, Volume VI, Number 1, 1995
Effective integration of TSY and the telecommunication networks provides TSY an ability to build flexible systems for its multiple clients. Quality indicators look like the ability of these systems to meet customer expectations.

How IT's Used in the Measure of Progress Element

The measure of progress element provides "real-time" information for evaluation and improvement of quality system processes and practices. TSY has developed quality indicators and connected the computation of these indices with information from TSY. By having the information system identify problems before the customer realizes that a problem occurred, the company can address and solve problems proactively. This also enables the company to focus its atten-
tions on continuous improvement of the processes that create these problems. Pipes says, in relation to the quality information system, that:

From a management point of view, quality indicators are the best things that have ever happened, as far as directing management effort. You have a process in place that allows you to focus your associate level workloads in the direction you want. You are achieving your overall strategic objective. If you measure the output of a process, then you will improve that process. You have a benchmark of where it is going.

Quality indicators and measures are computed based on the formal TSY system. Each division meets to discuss its goals and arrive at the quality measures. Daily quality indicators are computed. These daily quality indicators are reviewed to identify root causes of the problems. By measuring and focusing on the root cause of the problem, attention is given to the issue which then gives management the ability to resolve the problem. The daily information is encapsulated into daily reports, weekly summaries, and the executive monthly summaries. Pipes reiterates:

Once a month we have a business review, where we put together a summary of all the events that occurred for the month. We present that to senior management. The focus of this meeting is on quality indicators. These meetings allow each division to understand what divisions they impact.

The quality indices change periodically. The indicators used with UCS have varied from 10 to 20 depending on the period and the urgency of the problems. The quality indica-
tors put pressure on everyone to perform well. For example, the trouble ticket system which alerts employees to problems on a real-time basis created an environment of proactive and team-oriented problem solving. This created the following flow of information:

1. The information system automatically identifies a prob-

lem as it is happening.

2. The trouble ticket is generated identifying the respon-

Journal of Information Technology Management, Volume VI, Number 1, 1995
sible functional areas that need to address the problem.

3. The problem is addressed in a cross-functional way that searches for the root cause of the problem. A Continuous Improvement Team (CIT), an ad-hoc group of employees, is created to focus on a particular problem and work to rebuild the process so that the problem does not reappear.

4. The problem is solved across functions and the improvement provided by the solution is tracked by the information system.

5. If there are no more problems in this area for a reasonable period of time, this quality indicator is discontinued. New ones are created as needed.

Thus, this process identifies and solves problems in an area of focus before the customer realizes that a problem has occurred. Once the problem is solved, this team is disbanded, and attention is brought to bear on other problems.

How IT Is Used to Obtain Customer Satisfaction: The Goal

The goal element is designed to deliver continually improving value to a customer. TSYS has been focusing on quality improvement strategies in order to provide continuous improvements to its customers. For example, based on customer feedback, TSYS is using imaging technology to scan cardholder correspondence and other documents and store them in computers. These can be retrieved for on-screen viewing. With imaging, documents can be quickly brought up on screens during conversations with customers. This reduces paper handling and greatly increases efficiency for card issuers who often have rooms packed with customer files.

The quality information systems at TSYS have improved the ability to meet customer needs by encouraging proactive problem solving and cooperation among divisions. For example, when a statement production area sends out duplicate bills to a bank’s credit card customers, a trouble ticket is automatically generated by the system. The employees in the statement production area now become responsible for identifying the root cause of the problem. Therefore, customers would be sent another note asking them to ignore the second bill, before they call the banks and complain about the duplicate bill. In this instance, the quality measure cannot prevent a problem from occurring for the first time. However, the trouble ticket will not be closed until the root cause of the problem is identified and corrected. Information technology identifies the problem, then the employees find the cause and work toward a solution. As stated earlier, the mere act of measuring a process provides focus on the process. And the attention brought to bear by focusing on the process tends to improve the process. Pipes states:

Working with UCS executives, we determine the quality measures and the performance standards. The information system tells us whether the standards have been met and not met. We can also query the system early in the morning to check whether any trouble ticket has been created so that we can discuss the resolution of that ticket during the morning meeting.

The emphasis on quality measures has led to improved cooperation between TSYS and UCS and within functional divisions of both companies. Many times a trouble ticket identifies problems that are of concern between functional areas between the two organizations or within an organization. By identification of cross-functional problems, employees can see how their performances affect other functions. Pipes explains how use of quality measures has improved cooperation between the companies and within TSYS:

"Availability of quality measures can be a cornerstone practice on everyone to perform well. For example, if I have had people from UCS come up to me and say, "Why was your system down for 22 minutes yesterday?" I couldn’t get out all my mail and I missed my quality indicator. This really fosters a team spirit. You can’t have one department doing something at the expense of another, since it will result in missing quality indicators for the company."

The measurement and posting of the quality indices make it possible for individuals to realize how they are not doing isolated jobs, but are contributing to the success of the company. In a meeting to discuss the impact of IS and quality on TSYS, an executive in charge of a division at TSYS said:

"Quality measurement makes it possible to thread through very many different functions that otherwise will never sit in the same room. It makes it possible to trust others and relationships between managers and employees have improved. Pipes states how TQM implies being a team player:

"We talk not about "cowboys" but "champions." A champion leads a group that goes out and attacks the problem and solves it. It comes back to the joint development environment where you get everyone into the process that the process affects."

The goal element represents the end result, but is also the starting point for continual improvement of the systems, measures, and senior executives focus. Quality measures provide an ability for an employee to gauge his/her contributions to the goals of the company on an on-going basis. Pipes states:

"You take pride in the accomplishment of the goals that have been set up. It's not a continuous flow of processes that have no beginning and no end. Your quality measures give you a kind of "here's today; I made the day" feeling. So, there is a little task that you accomplished.

Journal of Information Technology Management, Volume VI, Number 1, 1995
that you can hold onto for today. The quality mandate relates to a specific task, a specific goal, and a specific reward.

**Implications for Other Service Companies**

The quality information systems developed within TYS have been responsible for measuring and monitoring the quality of TYS's performance. TYS developed quality information systems using employees of the operational divisions, not the MIS division. Employees in the divisions who understood the operations were placed in charge of reporting the quality measures and devised simple information systems to compute the statistics. They pulled data from TYS, but devised their own heuristic in computing the quality measures. Having employees within the divisions compute the measures provides a better acceptance of the results. Also, the local employees were able to discard measuring some quality indicators and start measuring new ones very quickly. They were part of the local division culture and felt included. Thus, making quality measurements as a staff service within each division might be more advantageous to TYS and other service companies rather than leaving a central division compute these statistics.

Figure 1 summarizes how IT has been used to measure service quality and improve operations in TYS. The analysis of IT's use to measure service quality in TYS shows that there are four steps to this strategy. These four steps are: (1) senior managers need to encourage quality measurements and review quality indices periodically to bring focus to the processes that are doing well and that need improvement, (2) IT division needs to create flexible systems in order to meet or exceed customer expectations, (3) each functional division needs to create and compute quality indices to measure the progress made in the use of flexible systems to meet customer needs, and (4) employees need to be encouraged to monitor the measures so as to proactively change the processes and prevent occurances of problems. Other service companies could use a similar strategy to leverage their investment in IT to improve the quality of service. Lack of such strategies to improve quality could be disastrous to service companies according to Pipes:

> In the service industry, what else is there than better service? Banking services are no longer restricted geographically, people are beginning to have the option of going down the street to the bank or doing it at home using an 800 number and contacting a bank across the country. In order to improve service quality, we have to define the tasks, set standards, and measure them. The information systems track whether the tasks are performed according to standards or not. Service industries have to follow similar strategies to improve quality or they will perish due to loss of market share.

38 Journal of Information Technology Management, Volume VI, Number 1, 1995
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Journal of Information Technology Management, Volume VI, Number 1, 1995