8-2005

Service Quality from the Other Side: Information Systems Management at Duquesne Light

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Copyright Information:

Reference:
Bharati, P. and Berg, D. (2005), "Service Quality from the Other Side: Information Systems Management at Duquesne Light", International Journal of Information Management, Vol. 25, No. 4, pp. 367-380.

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Abstract:

Service organizations are continuously endeavoring to improve their quality of service as it is of paramount importance to them. Despite the importance of understanding the relationship of service quality and information systems, this research has not been pursued extensively. This study has addressed this gap in the research literature and studied how information systems impacts service quality. A research model is developed based on IS success model. System quality, information quality, user IT characteristics, employee IT performance and technical support are identified as important elements that influence service quality. An in-depth case study from the electric utility industry is used to investigate the impact.

Service Quality from the Other Side: Information Systems Management at Duquesne Light

Introduction

Customer service is still a very important aspect of a service organization (Karimi *et al*, 2001). Therefore, quality of services provided by an organization has emerged as an important area of research. In practice, service organizations are continuously endeavoring to improve their quality of service as it is of paramount importance to them (Berry and Parasuraman, 1997). The improvement of the quality of services is one of the primary reasons organizations are investing in information systems (IS) (National Research Council, 1994). Despite the importance of understanding the relationship of service quality and information systems, this research has not been pursued extensively.

The IS literature has paid attention to quality of systems development (Austin, 2001; Ravichandran and Rai, 2000; Stylianou and Kumar, 2000) and customer service (Karimi *et al*, 2001). Several studies on information systems (IS) service quality (Jiang *et al*, 2000; Jiang, Klein, and Carr, 2002; Kettinger and Lee, 1997; Kettinger and Lee, 1999; Pitt *et al*, 1995; Pitt *et al*, 1997; Van Dyke *et al*, 1997; Van Dyke *et al*, 1999; Watson *et al*, 1998) have been conducted. Studies have also investigated the total quality management (TQM) of system development (Ravichandran and Rai, 1999; Ravichandran and Rai, 2000). Still, these studies have not addressed the issue of how information

systems impacts service quality. This research has addressed this gap in the research literature and conducted a case study of Duquesne Light to investigate how information systems impact service quality.

An electric utility should consider information technology as the single most important strategic asset (Weiner *et al*, 1997). Therefore, it is important for electric utility firms managing information systems to improve service quality. The first step in understanding the impact of IS on service quality is to comprehend the impact of IS on various levels. A model was developed using theoretical concepts from management information systems, communications and strategy and a case study was conducted.

Research Question and Conceptual Model

Several approaches to measuring the effectiveness of information systems have been used in previous investigations including cost-benefit analysis, system usage estimation, and user satisfaction (King and Rodriguez, 1978; Srinivasan, 1985). However, there is no consensus among IS researchers on the conceptualization and operationalization of IS effectiveness (DeLone and McLean, 1992; Goodhue, 1992; Hamilton and Chervany, 1981; Ives and Olson, 1984; Miller and Doyle, 1987; Srinivasan, 1985; Zmud, 1979). In other related fields of research, cost-based approaches have been criticized for the neglect of overall strategic benefits (Mechlin and Berg, 1980).

Quality of the IS function has received a lot of attention in the recent IS literature (Ravichandran and Rai, 2000; Stylianou and Kumar, 2000). Several studies on the quality of the service component of the IS function i.e. information systems service quality have also been conducted (Jiang, Klein, and Carr, 2002; Jiang *et al*, 2000; Kettinger and Lee, 1997; Kettinger and Lee, 1999; Pitt *et al*, 1995; Pitt *et al*, 1997; Van Dyke *et al*, 1997; Van Dyke *et al*, 1999; Watson *et al*, 1998). One of these models (Pitt *et al*, 1995) has been criticized for ignoring several factors (Stylianou and Kumar, 2000). Total Quality Management (TQM) has been employed to study the quality of system development (Ravichandran and Rai, 2000; Ravichandran and Rai, 1999). Various aspects of quality have been addressed but the impact of information systems on service quality has not been studied. This paper addresses this lacuna in the literature and develops a model to explain the impact.

The purpose of the case study is to investigate how information systems impact the service quality of the organization. In order to understand the conceptualization of information systems' impact on service quality, one method is to ascertain the perceptions of the practitioners of information systems of their work on service quality dimensions. Customer contact employees or service employees are, in effect, intermediate customers of various support services and intermediate service quality problems result in problems at the consumer level (Zeithaml, Parasuraman, and Berry, 1990). The present research deals with the first part of evaluating the relationship using perceptions of IS professionals.

The conceptual model is based on DeLone and McLean's (1992) taxonomy of information system success. The factors in the conceptual model fall in the different categories of technical level, semantic level and effectiveness level. Since the DeLone and McLean (1992) model is based on the product-oriented Shannon and Weaver (1949) model, some changes were essential in order to make the conceptual model more relevant to a service organization. The conceptual model is shown in Figure 1. It shows various factors of information systems that are directly or indirectly related to service quality.

The conceptual model (Figure 1) elucidates the relationship between the various factors of information systems and service quality. Service quality is also comprised of several factors. System quality, information quality and employee IT characteristics affect service quality indirectly. Technical support influences the service quality directly. System quality, information quality and employee IT characteristics affect employee IT performance, which, in turn, impacts the service quality. Each factor of the model is discussed using theoretical reasoning.

The research model examines the relationship between how information systems (system quality and information quality) and its service manifestation (technical support), along with employee IT characteristics, impact the IT performance of employees. IT performance of employees in turn impacts the dimensions of service quality. Since this relationship is only visible to the IS professionals, it is imperative that they evaluate the potential impact of IS on service quality. A survey was also conducted on the research model. The results have been published separately (Bharati and Berg, 1999).

Service Quality

Service quality is the extent to which a service met the expectations of customers (Gronroos, 1982; Parasuraman, Zeithaml and Berry, 1985; Reeves and Bednar, 1994). Researchers have proposed several dimensions and approaches to service quality (Gronroos, 1982), the most widely used and accepted being those proposed by Parasuraman, Zeithaml, and Berry (1988).

Service quality has five dimensions and it has been developed into an instrument (Parasuraman, Zeithaml, and Berry, 1988). The five dimensions are tangibles, reliability, responsiveness, assurance, and empathy. The literature (Babakus. and Boller, 1992; Cronin and Taylor, 1992; National Research Council, 1994; Parasuraman, Berry and Zeithaml, 1993) reveals that perceptions-only scores are superior to the perceptions-minus-expectations difference scores in terms of reliability, convergent validity and predictive validity. Therefore, a perception only measure of service quality was employed for this research. Another conceptual problem with SERVQUAL concerns the applicability of a single instrument for measuring service quality across different industries. Certain adjustments were made to SERVQUAL in order to make it more applicable to the electric utility industry. Service quality in this model is measured based on the IS division's perception.

Employee IT Performance

The impact of the information system on employee IT performance has an influence on the service quality provided. In the case of employee IT performance, several variables have been used in previous studies. Decision effectiveness has been used (Chervany, Dickson, and Kozar, 1972). Efficiency of task completion, which is a measure of speed of completion, has also been used with different variations in studies (DeBrander and Thiers, 1984; Sanders and Courtney, 1985). Other measures such as decision confidence (Goslar, Green, and Hughes, 1986; Guental, Surprenant, and Bubeck, 1984; Zmud, Blocher, and Moffie, 1983) and time-to-decision (Belardo, Karwan and Wallace, 1982; Benbasat, Dexter, and Masulis, 1981; Hughes, 1987) have also been employed. These measures were used to measure employee IT performance.

System Quality

System quality represents the quality of the information system, which is a manifestation of system hardware and software. Therefore, the quality of the system is manifested in the system's overall performance, which can be measured by individual perceptions. Perceptual measures such as ease of use (Belardo, Karwan, and Wallace, 1982), convenience of access (Bailey and Pearson, 1983), system reliability (Srinivasan, 1985) have been used in the survey instrument to measure system quality.

Information Quality

Quality of information has been discussed a great deal in the IS literature as the information provided by the information system is important. Gallagher (1974) has used

user perception of the value of information system to determine the information quality of the system. The decision-maker estimates the value of an information system. The measures that have been used for information quality are information accuracy (Bailey and Pearson, 1983; Mahmood, 1987; Miller and Doyle, 1987; Srinivasan, 1985), information completeness (Bailey and Pearson, 1983; Miller and Doyle, 1987), information relevance (Bailey and Pearson, 1983; King and Epstein, 1983; Miller and Doyle, 1987; Srinivasan, 1985) and information timeliness (Bailey and Pearson, 1983; King and Epstein, 1983; Mahmood, 1987; Miller and Doyle, 1987; Srinivasan, 1985).

Employee IT Characteristics

Employees' perception of IT is a key factor in determining the performance of employees. Attitudes and feelings of the employees toward IT, the experience they have had in the information systems and the training they have had in the information systems constitute employee IT characteristics and the feeling they have toward IT (Bailey and Pearson, 1983; Goodhue, 1986).

Technical Support

Technical support is a service that the information systems department provides to the users. Technical support influences service quality although the user might interact with one or multiple information systems. The user as well as the ultimate customer is concerned about technical support. In instances when the information system is critical to the performance of the firm, technical support has an impact on service quality. Technical

support responsiveness, competence and dependability have been employed as measures of technical support in several previous studies (Jiang *et al*, 2000; Jiang, Klein, and Carr, 2002; Kettinger and Lee, 1999; Pitt, Watson and Kavan, 1995; Pitt *et al*, 1997; Van Dyke *et al*, 1997; Van Dyke *et al*, 1999; Watson *et al*, 1998).

Method

The purpose of the case study is to investigate how information systems impact the service quality of the organization. In order to understand the conceptualization of information systems' impact on service quality, one method is to ascertain the perceptions of the practitioners of information systems of their work on service quality dimensions. Customer contact employees or service employees are, in effect, intermediate customers of various support services and intermediate service quality problems result in problems at the consumer level (Zeithaml, Parasuraman, and Berry, 1990). The present research deals with the first part of evaluating the relationship using perceptions of IS professionals.

This case provides an opportunity to investigate "a contemporary phenomenon within some real-life context" (Yin, 1984, Pg. 13). In the first phase of the case study, preliminary information from secondary sources was collected about the electric utility industry. The subject of the case study was finalized after some preliminary research on the firms that were employing information system that impact service quality.

Background information about Duquesne Light Company was also collected during this phase. Contacts were made to get information from Duquesne and, also, from external sources of information.

Semi-structured interviews were conducted in this phase of the study to explore and understand the research model. Before the on site interviews, phone interviews were also conducted to improve the design of the study. The author conducted field visits to understand the management of this information system at Duquesne Light. The interviews were conducted in the offices of Duquesne Light and the interviewee was assured of confidentiality. After the investigator and interviewee introduced themselves a semi-structured interview was conducted that focused on how did the information system impact service quality of the organization. Interviews were conducted with the employees who were directly or indirectly involved in the management of this information systems for the firm. Interviews were conducted from the project manager level to the senior management level.

In the third phase of the study, internal documents and technical literature about IS at Duquesne Light Company was integrated into the model. Follow up phone interviews were conducted for clarification. Multiple sources of evidence were considered and employed as the case study was conducted. The structure chosen for the case study is Linear-Analytic (Yin, 1994). Several articles and books on case method and recent case studies were employed to improve the quality of this case study (Eisenhardt, 1989; Dube

and Pare, 2003; Lee, 1989; Orlikowski, 1993; Sarkar and Lee, 2002; Shanks, 1997; Silverman, 2001; Silverman, 2000; Walsham, 2002; Walsham, 1995; Yin, 1994).

Case Study

Duquesne Light is an electric utility which serves about 0.6 million customers in southwestern Pennsylvania. Duquesne Light, whose origin dates back to 1880, was engaged in the production, transmission, distribution and sale of electric energy. Recently, it has sold its production activities and is now a "wires" company. Its service territory is approximately 800 square miles covering Allegheny and Beaver counties, including the city of Pittsburgh, in Pennsylvania. In addition to the direct customers of this region, Duquesne Light also sells electricity to other utilities[1].

Brief Overview of IS at Duquesne Light

Information systems are used in a wide range of activities at Duquesne Light. The information systems range from Energy Management Systems (EMS) to Customer Advanced Reliability Systems (CARS). In the recent past, Duquesne Light has undertaken several initiatives in information systems and one of the major initiatives has been CARS.

CARS is an enterprise-wide information network that provides two-way data communication. This is largely a wireless automated data acquisition network having an

[1] Source: DQE Home Page (http://www.dqe.com)

open architecture from top to bottom. This research study will focus on CARS. It will also look at other major IS projects that interface with the CARS system. Specifically, it will try to study how this information system is impacting service quality. This case study will help in understanding how information systems impacts service quality and, hence, how we can design information systems for service quality.

The Case of Duquesne Light

During the data collection process a preliminary data analysis was conducted which aided in refining and focusing the research questions. During the interviews, questions were asked on the research model. The questions that were explored in-depth depended on the subject's area of expertise and experience. The information received from the interviews was reduced and, later, categorized. The second stage of the analysis involved reducing the information in the form of a final schema or model. The case, which has been abridged because of space constraints, follows the model structure and presents relevant information.

System Quality and Employee IT Performance

System quality is the quality of the information system itself, largely, the software and the hardware. This quality of the system is reflected in the overall performance of the

system. At Duquesne Light this aspect of the system seems to have impacted the IT performance of the employees.

The project manager of CARS says, *"A good system will enhance the performance of the employees. It is a tool for them, it is something they should be using. If that tool breaks down [or] if it does not give them what they need [or] if it gives them the wrong information- it effects their performance."*

Reliability of the system is extremely important. This is illustrated in an obvious but interesting example by The project manager of CARS, *"If they [employees] rely on the system to provide say work orders, for example, everyday. It [the work order system] is supposed to generate a work order. It gives that employee the work he has to do for that day. [If] that system fails, employee is not able to do his work, therefore, the quality of the overall operation, the services operation, goes down because they are sitting idle, sitting and waiting on instructions, to do things. Some systems can be very mission critical, where without that system, literally, the operation does not function."*

The system quality impacts different aspects of employee IT performance according to the director of field operations for CARS. The employees can get the information quicker if the quality of the system is good. In the case of CARS, employees can query more information thus empowering the employees with more information, which can make them more effective and efficient. The employees are also more confident about the

information when the system is good. Thus, the IT performance of the employees is effected in a positive way when the system is of good quality.

Information Quality and Employee IT Performance

The quality of the information provided by the information system is important for the firm. This information quality influences the employee IT performance. When the information is packaged well it helps the employee receive the complete, relevant and accurate information, thinks the director of field operations for CARS.

When good information is provided to the employees through the information system then they are usually more effective in their work. The experience of IT managers at Duquesne seems to substantiate this. As the manager of IT and customer service says, *"In the automatic number identification [system], when the customer calls by phone we immediately know his/her phone number and as soon as the customer representative answers the phone they get the customer information on the screen [of the computer] – account, name, status etc. – right then and there."* This enhanced information enables the employee to take decisions faster and with more confidence, which in turn helps the employees to serve the customers better.

Employee IT Characteristics and Employee IT Performance

The IT characteristics of the employees are important to the performance of the employees. This includes the IT attitudes of the employees, the experience they have in the information systems, the training they have in the information systems and the feeling they have towards IT. These IT attitudes have an influence on the user's acceptance of the system. The adaptability of the employees towards information systems also influences their effectiveness and efficiencies. This has been the experience of the director of field operations for CARS.

Although, the negative impact of information systems can be minimized, *"If you can work out training and utilize employees in different areas or you get them to be more proficient with the new technology, it is very well accepted. As it helps them to do their jobs better."*, says the manager of IT and customer service. The user's IT attitudes have to be given due consideration in order for the employees to have better IT performance. The experience of the employees towards IT and the training they have received in IT has an impact in improving the IT performance of the employees.

The project manager for CARS makes an interesting comment regarding the IT attitudes of employees, he says, *"Employees perform better if they have good attitudes towards the technology. If technology is working for them and helping them to do their jobs better then they are more inclined to use it."*

System Quality and Service Quality

System quality, which broadly is the hardware and software of the system, is manifested in the overall performance of the system. The quality of the system usually impacts the services that the firm provides, although, indirectly through the employee IT performance. In the case of CARS, the quality of the information system has had an impact on the services that Duquesne Light provides to its customers by improving the IT performance of the employees.

The president mentioned some of the ways in which the CARS system has impacted the various services that Dusquesne Light provides to its customers. He says, one of the new services possible is, *"The capability of turn on turn off, right now as a customer you want to move, you call the company and say I am moving out of my house at 3 p.m. on Friday, you send somebody out and they read the meter one last time, you are out of your house, and we send your final bill …. With two way communication systems you do not have to send anybody out, when somebody calls and says that they want a final read you post the network, we get the final read, we do not send anybody out and we send out the final bill."* The ease of use of the system and the flexibility of the system enables the employees to provide more responsive and empathetic services.

The president gives another instance when services have been impacted because the system has provided new capabilities like, *"Outage management capability, right now, the current level of technology in the business is when you are out (no electricity) as a customer, the only way they know is when you get on the phone and tell us, to this day 99% of the customers in the United States that is the level of technology. The only way*

we know for sure that you are back on, is if we call you and you tell us you are back on. Now a lot of the times the company will deal with major circuits but there will be somebody will be down at the end of the road, who will be out and you do not know they are out because they have not called you to tell you that they are out or they did not call you to tell you that they were back on. And, of course, this capability we can automatically have. This gives us a much higher level of restoration. We know immediately when people are out, down to the house level, and when people are on." The capability of the system to be able to access the information down to the house level reliably enables the employees to provide the services more dependably and promptly.

Reinforcing the opinion of the manager of IT and customer service and manager of MIS, the project manager for CARS says, *"I guess … degrees of quality, with better data they could be a little more better with poor data there is more problems. An example in that case is a meter reading system, a system that we have. If you are getting accurate readings, those readings are very accurate, a 100% accurate at best, then, you do not have any billing errors and then your quality of the system is very good. Now, if it deteriorates to 95% or 90% accuracy then your system may still run but you will get more billing complaints etc."* Therefore, the information system's reliability is a key factor in determining service reliability of the firm.

Another key issue is that it is not only the information system that is directly related to the service of the firm but also other information systems that receive information from or provide information to the information system that is directly providing the service. As

the manager of IT and customer service says, *"Supervisory control and data access system (SCADA), which monitors the devices and control them remotely. The automation of the equipment is also very helpful, the problem is detected, isolated and restored via remote devices."* He further comments, *"All kinds of predictive devices are being used that help in restoring services quicker. Not only do they prevent outages but also predict when you might have an outage."* These predictive systems enable the employees to improve their IT performance and, therefore, provide better and faster service to the customers.

The information system itself is not enough as the technology that supports this information system is extremely important. Commenting on the wireless technology, he says, *"A robust communication technology, like the trunk radio technology, which is the next generation of radio services, which is more than voice, it is data. Data is what you need to know what [has] happen[ed] and what you need to do to solve that."* Therefore, the Duquesne information systems' overall performance provides the information to the employees, who can take effective decisions with more confidence and, thus, resolve the problems of the customer more accurately.

Information Quality and Service Quality

The information provided by the information system of the firm usually has an impact on services provided by the firm. A new information system generally changes the

information flows in the organization. Thus, this usually impacts the services that the firm provides to its customers.

The new information system has had an impact on the services that Duquesne provides to its customers. Explaining how the process has changed, the president says, *"Up to a few years ago, you had meter cards, you even did not know where each of these meters were and you had these stack of index cards. You had these paper maps, which often did not have streets on them, just maps of hillside and couples of lines crossing. People that were out [of electricity] and who had been calling on the telephone, you did not know which circuit each one is on and, so, you see how technology has dramatically changed how quickly we can respond to people, how quickly we can get their information."* This illustrates how the accuracy and relevance of information influences the IT performance of employees, who can be more responsive.

Another instance how information quality has enhanced the reliability, responsiveness and empathy of services provided by Duquesne Light was stated by the project manager of CARS, he says, *"If you are building a house and you need your service connected, you are ready for your service and you call in and the next day a line truck is out there and they connect up your power and puts you in service, now you are saying hey that is pretty good, you know that company did a pretty good job we called one day and the next day they were out there to hook us up. That company is responsive to our needs, they are a good service provider. … Now how does the system do that, you get that work order out there get all the information out there, so that you can immediately dispatch a crew*

to hook that customer up. Well if that dispatching process is streamlined and speeded up through the system then you will get that crew out there the next day and they will get that customer hooked up. You get the right information at the right time. More timely, more accurately …" The timeliness, accuracy and completeness of information enables the employees to take timely and effective decisions, which helps in improving the quality of service.

An instance that illustrates the impact of information quality on services, was mentioned by the manager of IT and customer service, he says, *"A service that is possible is the on demand read, they (the customer) cannot believe that we can do that but we can. Recently, we had a customer call in complaining that their bill is too high, [saying] 'I did not use this kind of energy'. The customer representative called up the system and looked at the last 30 days. On one weekend he saw a tremendous spike in usage and asked [the customer] if they had a lot of company on that day. Then the customer remembered what the source of the usage was. So, these are all things that satisfy [the customer] and make our service better."* The timeliness and relevance of the information provided by the information system made it possible for the customer service representative to be more responsive and empathetic to the customer.

Employee IT Characteristics and Service Quality

The IT characteristics of the employees are important to the performance of the employees. The IT characteristics include the IT attitudes of the employees, the

experience they have in the information systems, the training they have in the information systems. The attitude of employees towards IT, employees' experience and training in information systems usually has an impact on the quality of services of the firm. In the case of internal users, usually the employees, if they are resistant to use the new information systems then it will impact the services provided by Duquesne.

Therefore the adaptability of the employees, who are the internal users, influences the service quality. Especially the employees will only use the system if it is in their benefit to do so and it helps them in doing their job better. Thus, favorable employee IT characteristics do impact the service quality in a positive way.

Technical Support and Service Quality

The technical support provided by the firm to its employees usually influences the services that the firm provides. Technical support is a service provided to the employees. Although, it directly and greatly influences the services that the firm provides to its customers.

The quality of technical support has to increase as the needs of the users change. Technical support people will have to have the ability and knowledge to be able to provide a higher level of support. Duquesne is in the process of moving into this stage. As the manager of MIS, says, *"As the needs of the user/customer change, we are moving towards an Enterprise Support Center. As more and more advanced resources are*

becoming available to the user/customer we will have to provide a higher level of technical support. User will still call in for a security problem, PC breakage or hardware problem but we are trying to provide technical support to a user who is trying to query a data warehouse. So, they need information about the data, or they are not able to do this with the tool, or want to something more sophisticated with the tool. The level of support will be different."

In order to have good service quality it is essential to have good technical support. Therefore, the manager of MIS, says, *"In the case of the customer information system (DISCuS system), we impose a set of performance criteria in the IT department so that we can support that system. Just as our customers expect our system to be there, the IT customers expect the information system to be there."* Therefore, the dependability and responsiveness of the system and the technical support has a major influence on the service quality.

The technical support provided by the IT department to the employees, who are generally the users of the system, effects the service quality. In some cases, the impact of technical support provided is very important, as the manager of IT and customer service says, *"If the DISCuS system[customer information system] is down then we can as well send all the customer representatives home. There is no way to do anything without the system."* This illustrates how critical technical support is to maintain and improve the quality of services provided to the customers.

Employee IT Performance and Service Quality

The impact of information systems on the employees is manifested in the employee IT performance. The employee IT performance usually impacts the service quality of the firm.

The CARS system has also impacted those employees who are in direct contact with the customers. As the The project manager of CARS, says, *"In the case of customer service department, employees who take the phone calls, is a good example of [how] the information that you get out of the system is helping the employees to provide better service."* The employees in the customer service department, because of the IT satisfaction and decision confidence are able to provide more empathetic and responsive service. The manager of IT and customer service, says, *"It enables employees to do a good job and provide better service to the customers."*

The manager of IT and customer service says that the responsiveness of service has improved considerably because of better employee IT performance. This illustrates how different information systems at Duquesne Light work together to provide the information to the employees. An example is given by the manager of IT and customer service, *"First of all you have to be able to detect when there is a problem. So, we have an automated distribution system that monitors all our lines, circuit breakers, devices. We did not have [the capability] up until the CARS system of when our customer had a*

problem, now we can get the customer outage information, it also provides the information when the customer is back online. The CARS is not just an automatic meter reading system but a communication system. Data, communication, knowledge, about the customer is very important, so we have done that."

He goes on to say, *"Once you have this system, what do you do to realize a better rate of service quality. We have a system installed called the work management system, that system allows us to automatically transfer work orders based on certain types of jobs, it would automatically order out equipment, it would estimate the time to do this job, it estimates the cost of doing the job and it keeps track of all these transactions. Part of that is a remote data terminal in our trucks, which creates a mobile work force, where information is right to them. They do not have to get it by phone, come back write the work order on a piece of paper, go gather up equipment etc. Everything is done automatically to their truck, including site delivery of material for major jobs. You help your responsiveness, which is quality of service by systems, which can better enhance your communication of data. Work management is a very good example of that."*

The above example clearly states how all the information systems working together are able to provide the information to the employees, who, in turn, with confidence and in lesser time are able to provide very responsive service. The responsiveness has greater importance in critical tasks like outage management, where this system is also being used. This has enabled Duquesne to improve service quality considerably. Finally,

according to the president of Duquesne Light, the key factors in improving the quality of service are people and systems.

Discussion

Service quality of the IS function has been investigated in the MIS literature but not what has not been investigated is how IS influences service quality. This is the first case study that investigates how information systems contribute towards service quality in an organization. The objective of the research is to contribute towards the theoretical and practical understanding of how IS impacts service quality of an organization. This model has been formulated based on theories of IS success, service quality and communications.

The case study, based on the perceptions and opinions of IT professionals, has aided in the development of a model that explains how information systems effects service quality. The framework suggests factors of information systems that impact service quality directly and the factors that impact service quality indirectly. The case has demonstrated that system quality, information quality and employee IT characteristics influence employee IT performance, which in turn influences the service quality. Therefore, it is important to note that a change in service quality of an organization can be as a result of information quality, system quality or employee IT characteristics' effects on employee IT performance. Technical support on the other hand has a direct effect on service quality.

Research Implications and Future Research

The research model was partly based on the work of DeLone and McLean (1992). The theory states that the impact of information systems is at different levels and the impact at the organizational level is through IS's impact on other previous levels. Therefore, the case study has strengthened the theory of DeLone and McLean (1992) that an information system has an impact on an organization at different levels. It has an impact at the technical level, semantic level, individual level, and organizational level. This is the first study that has modeled the impact of information systems on service quality and then conducted an in-depth case study.

The framework might be used, after some modifications, to explain information systems impact on service quality in other industries. The study found that technical support effects service quality directly. As illustrated in the case, most of the service is delivered through employees and the employees are dependent on IS to deliver these services. If the responsiveness of technical support is poor it hampers the ability of employees to provide service, hence negatively impacting service quality. Thus, technical support effects service quality directly. A modified framework can be used to explain how service quality is effected in other service organizations as the impact varies based on service. In the case of electronic services, a modified version of this framework can be used, although, the exact framework will depend on the type of service being delivered.

In organizations in general and service organizations in particular, it is imperative to maintain or improve the level of service. As the case has discussed, system quality indirectly impacts service quality. Managers should ensure that for service quality, adequate attention is given to not just the quality of the system but also employee IT performance in order to ensure adequate service quality. The ease with which the system can be used by customer service representatives in the electric utility industry helps the representatives to service customers better. This in turn helps in improving the quality of services that the organization is providing.

Similarly, information systems and user IT characteristics have an impact on service quality through their effects on individual IT performance. The IT attitudes of employees impact IT performance of employees and which in turn affects service quality. Thus this research provides a model that can help IS professionals and managers to decide what aspects of IS to focus on. It is usually difficult to understand the impact of IT on service quality as the effect is obfuscated by several factors. This research helps the practitioners to gain this insight.

Significant amount of future research is required before a robust research framework that explains the relationship between IT and service quality can be developed. Other researchers in the electric utility industry should conduct further empirical and theoretical studies. Qualitative and quantitative data should be used to improve the framework.

Furthermore, survey based techniques might be appropriate for quantitative data collection.

The model was developed for the electric utility industry, although, it can be used for other service industries as there are commonalties between different sectors in the service industries. The model can serve as a starting point in developing a framework for one of the sectors in the service industry. The model is made specifically for the electric utility industry and is based on the manner services are organized in this industry. In sectors of the service industry where services are organized in a similar manner, the model can be applied with minimal modifications. For industries where services are organized in very different ways more modifications will be required.

Conclusions

This research investigated the impact of information systems on service quality. A model based on theory was developed and an in-depth case study was conducted. This model is the first research model that elucidates the impact of information systems on service quality. The results showed that IS impacts service quality directly as well as indirectly. The indirect impact of IS on service quality is through the individual level. The study integrated varied but complementary literature to develop a theory in a new and important area of MIS research. The study advances the understanding of managing IS for service quality. The research also provides insights for IS professionals on how to manage information systems to improve service quality in organizations.

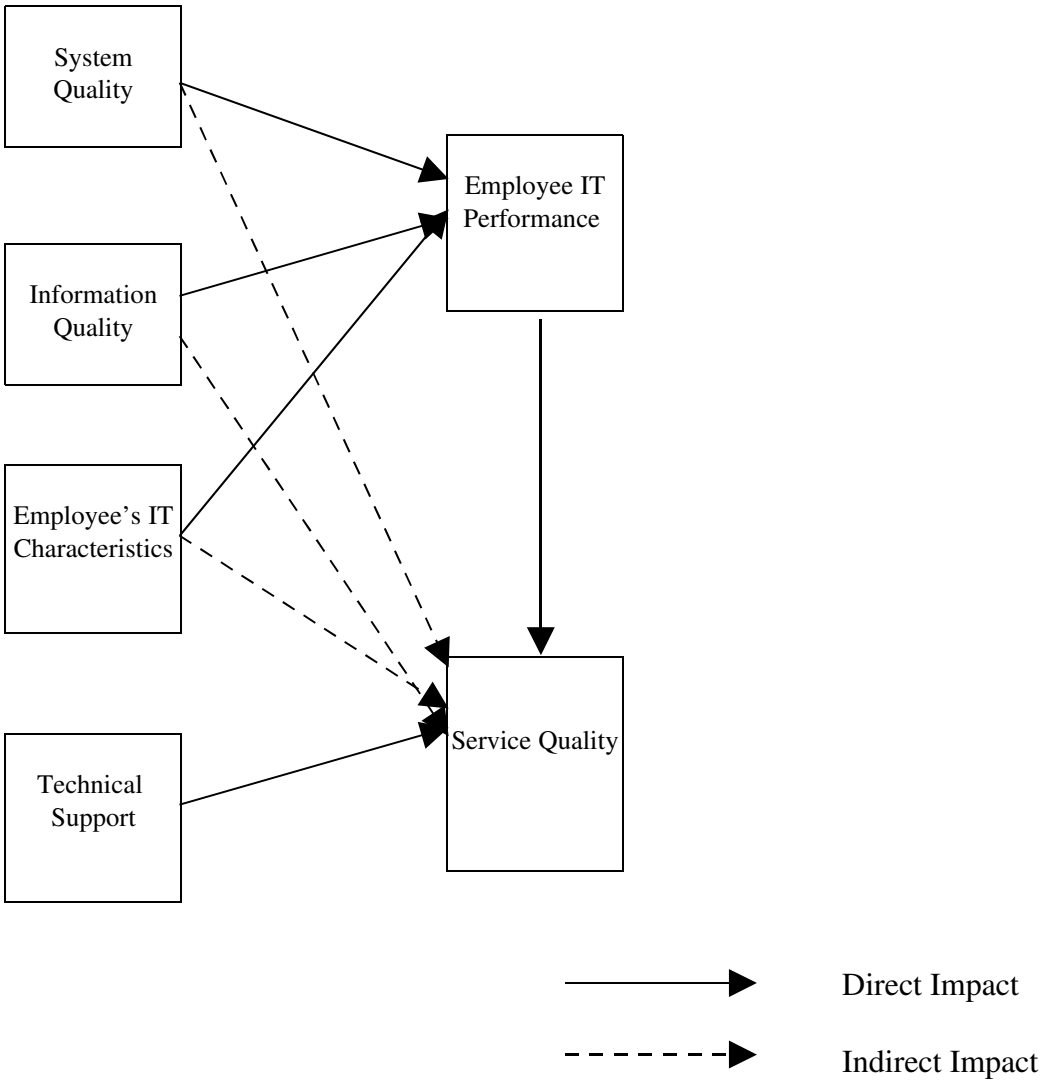

Figure 1: Model for Service Quality from the Other Side: Information Systems Management at Duquesne Light

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