Chapter VII

Evaluating IS Quality: Exploration of the Role of Expectations on Stakeholders' Evaluation

Carla Wilkin, Rodney Carr and Bill Hewett
Deakin University

INTRODUCTION

IT Evaluation is essential, given that the value of investment in the IT industry is currently almost $2 trillion US. There is no doubt that an effective organisation will try to evaluate IT effectiveness, by linking performance measures with a financial perspective (i.e. a shareholders' view); an internal business perspective (i.e. company planning for excellence); a customer perspective; and the innovation and learning perspective (i.e. the means to improve and create value), in order to move consistently forward.

The last three perspectives are at times derived by using the same measures/instruments, via an interpretive approach based upon views of different tiers of stakeholders. Such an approach reflects a movement away from the more technical measures like benchmarking. Instead, IT effectiveness is evaluated in terms of the use of IT, or success of IT outcomes, through seeking to understand the effectiveness of the delivered IT application to the job performance of stakeholders. The merit of this interpretive approach is increasingly applicable to sectors like ecommerce, where it is very apparent that customers are concerned with the effectiveness of such IT applications.

With regard to IT research, the interpretive approach was initially crystallised in the Success Model formulated by DeLone and McLean (1992). Their evaluative tools were Use and User Satisfaction. However, if research in related industries is considered, it rapidly becomes apparent that evaluation of quality is a more highly regarded approach. In seeking to adapt this approach to IT, it is important to consider the key components of an IT system, for which effectiveness would be measured in terms of quality; what quality means in an IT context; and how stakeholders internally derive an evaluation of such quality.

In summary, this chapter reports on research which has produced a redefined IS Success Model, in which quality is the key to effectiveness. It also reports results of a related empirical study, which reaffirmed this IS Success Model and then investigated whether quality was better measured in terms of stakeholders' expectations for IS performance and their perceptions of actual performance, or whether measurement of perceptions alone provided sufficient understanding of IS quality/effectiveness.

BACKGROUND: QUALITY AS THE DETERMINANT OF IS SUCCESS/EFFECTIVENESS

Although DeLone and McLean's (1992) work reflected published research about delivered IS at the time of their study (1981-88), IT isn't a static phenomenon. Problems have arisen as IS has increasingly been recognised by corporate leaders as a service function. IS have moved from the mainframe era to a more decentralised approach in which computing and communication technologies merge to deliver an ubiquitous IS service over local and wide area networks. Via inter- and intra- organisational communication and information systems, where LANs, EDI and end-user computing prevail (Browning, 1994; Cattell, 1994; Drucker, 1988; Harris 1996; Phillipson, 1994; Violino and Hoffman, 1994; Ward and Griffiths, 1995), IS has become regarded as the instrument or service by which an organisation can gain or retain a comparative or competitive advantage. DeLone and McLean's model, which focused upon the stakeholders' use and feelings of satisfaction as the means to evaluate IS effectiveness, may have been relevant when IS success was so aligned to efforts by the IS department. Now the diffusion of IS within and between organisations is much wider and thus its role must be evaluated with a more business-oriented approach via stakeholders' views of IS capacity to accurately accommodate input and output data, in the performance of their jobs.

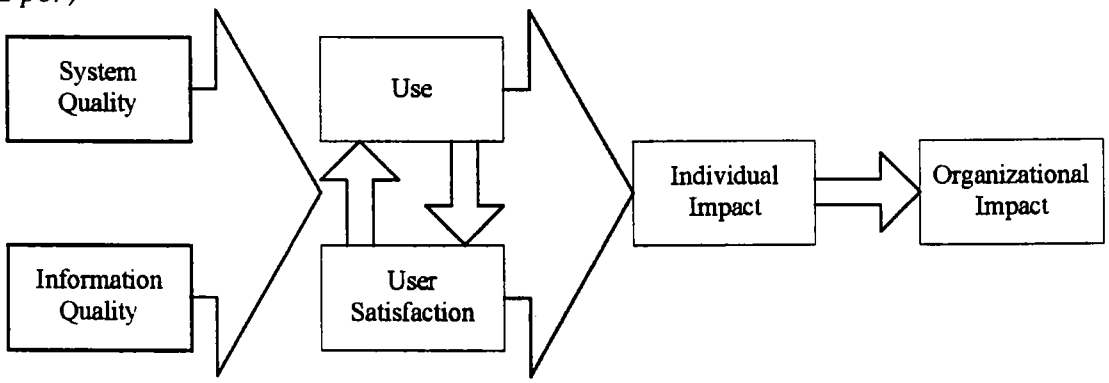
In seeking an alternative approach by which to evaluate IS success/effectiveness, it seemed pertinent to reconsider DeLone and McLean's own words. Given they used the term quality for framing the system and information components, this was the next point of consideration. Was it preferable and/or achievable to measure quality directly rather than through surrogates like use and user Satisfaction? Is there in fact a difference between satisfaction and quality? What does the term quality mean when it is used as a measure of success/effectiveness? How do stakeholders derive an internal measure of this quality/ effectiveness?

DeLone and McLean's IS Success Model

Historically, in evaluating IT effectiveness, the key paradigm has been DeLone and McLean's Success Model. Despite calling this taxonomy a success model, what was claimed to be evaluated was the "output variable – IS success or MIS effectiveness" (DeLone and McLean 1992 p61). In that context, effectiveness was equated to influence and defined (following Mason 1978 p227) as the "hierarchy of events which take place at the receiving end of an information system which may be used to identify the various approaches that might be used to measure output at the influence level." Such events included receipt and evaluation of information as well as its application. The existence of an IS is fundamental to this work, but the term information system is not actually defined by DeLone and McLean, although it is consistent with their work for IS to "be defined in terms of its function and structure: it contains people, processes, data models, technology, formalised language in a cohesive structure which serves some organisational purposes or function" (von Hellens 1997 p802).

DeLone and McLean's (1992) IS Success Model (see Figure 1 below) offered a complete and coherent, yet conceptual depiction of the interdependent success components in an information system. Based upon a study of IS research and literature, they defined the evaluation of IS success in terms of six components, wherein the key for measuring effectiveness was postulated to be use and user satisfaction, with reference to the system and information so provided.

Figure 1: Interdependent success components in information systems (Source: DeLone and McLean, 1992 p87)



It was also worth investigating whether later research had suggested inclusion of any additional components for the IS Success Model.

Extension to the IS Success Model: Service Quality

There are two ways in which an understanding of service applies to the IS function. The first one concerns the information system itself, which is more than a technical product, for its worth lies in its capacity to serve the needs of its end-users/stakeholders. With this approach, it's the whole system which provides service to user stakeholders, for people want not merely a machine but one which serves their needs; and not merely data but information which is pertinent to their requirements.

This is a changed focus from what was accepted at the time of DeLone and McLean's study. The change is most evident from comparison of their definitions of system quality and information quality, which they derived from their review, and those which evolved as a consequence of recent work with focus groups and interviews for the empirical study reported in this article (see Table 1).

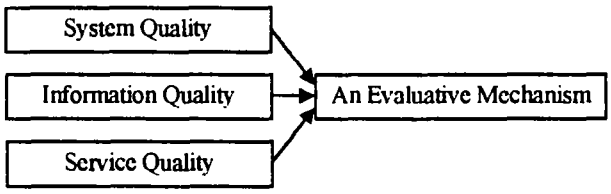
The second understanding of service concerns the role of the service or support facility. Such units, whether outsourced or in-house, are required to ensure acceptable system performance; sufficiently trained users; and technical facilities with the capability of generating the information desired. Hence it is most important to incorporate service quality as the third core component for delivered IS, because such IS departments deliver "informa-

Table 1: Comparison of Key Definitions (DeLone and McLean, 1992; Wilkin and Hewett, 1999)

Component	Meaning as Formulated by DeLone & McLean	Definition Developed by Wilkin
System Quality	Measures of the information processing system itself	A global judgement of the degree to which the technical components of delivered IS provide the quality of information and service as required by stakeholders including hardware, software, help screens and user manuals.
Information Quality	Measures of information system output	A global judgement of the degree to which these stakeholders are provided with information of excellent quality, with regard to their defined needs excluding user manuals and help screens (features of System Quality).

tion through both highly structured information systems and customised personal interactions" such that "effectiveness of an IS unit can be partially assessed by its capability to provide quality service to its users" (Pitt et al, 1995 p183). Again such a view aligned with findings in recent focus groups and interviews associated with the empirical study reported in this article.

Figure 2: Service quality in the IS success model (Wilkin and Hewett 1997)



With this inclusion, the IS Success Model now begins to reshape as set out in Figure 2.

In such a context, Service Quality is defined as "[a] global judgement or attitude relating to an assessment of the level of superiority or excellence or service, provided by the IS department and support personnel" (Wilkin and Hewett 1999).

An Evaluative Mechanism: Beyond Use and User Satisfaction

At the core of their model, DeLone and McLean evaluated the effectiveness/success of the IS in terms of the use of the system by stakeholders and in terms of such stakeholders' satisfaction with the system and information so generated. They saw use and user satisfaction to be interdependent. In turn, the outcome of this process would affect individuals in the performance of their jobs and in turn the organisation's performance in achieving business needs.

A review of the literature raised four key reasons for reconsidering Use and User Satisfaction as the evaluative mechanism.

A major problem concerns the measure of use. Extensive work by Seddon and associated researchers reveals that stakeholders have confused interpretations of its meaning. Firstly, they found IS use was confused with the concept *benefits from use*. A successful system should provide benefits like helping the user to work more efficiently or produce better work, so there has developed an assumption that the more time spent with a system, the more benefits it should provide. Such an assumption ignored individuals' work rates, expertise and the degree of user friendliness in the design. Actually, in a sense, this understanding of IS use being another term for benefits from use was found to be very close to individual impact and organisational impact in DeLone and McLean's 1992 model (Seddon and Fraser, 1995).

Secondly, the term IS use was interpreted as *future use* (Seddon and Fraser, 1995; Seddon, 1997). In this sense, IS use was measuring behaviour not IS success. This related to studies by Davis (1989, 1993) and Davis et al (1989) regarding measurement scales for predicting user acceptance of information systems, which found that perceived ease of use and perceived usefulness, were good indicators of user willingness, or user satisfaction. In fact Davis' findings of a pathway ease of use –> usefulness –> usage (assuming voluntary use) supported earlier findings by Goodwin (1987), Segars and Grover (1993), and Baroudi et al (1986), that the effective function of a system depends on useability.

Finally, IS use was only measurable after the system had been used and impacted on the individual and the organisation. Thus, these two impacts and user satisfaction as the consequences of use, would be better measures of IS success (Seddon and Fraser, 1995; Melone, 1990).

Another major problem is that the model shows use and user satisfaction to be interdependent, when the literature suggests each independently reflects IS effectiveness.

For example, where use is voluntary, a measure of success is the extent of use: but when use isn't voluntary, success is concerned with users' overall degree of satisfaction (Moynihan, 1982). One empirical study concluded that user involvement in requirements gathering, system definition and implementation, led to both user information satisfaction and system usage, and that user information satisfaction led to system usage, but not the reverse (Baroudi et al 1986). This proposition of interdependency, as discussed above, was also called into question by the finding of a different pathway (assuming voluntary use) ease of use –> usefulness –> usage (Davis 1989).

Equally problematic is that a focus upon user satisfaction implies a particular view of the IS facility, related to the attitude of end users rather than their output. As such, user computer attitudes may affect user satisfaction (Igersheim 1976; Lucas 1978). Even the degree of match between the characteristics of a task and the capacity of the system itself would control the satisfactory level of information generated and hence impinge upon user satisfaction (Goodhue 1986). Other work found that where tight links existed between system usage and work, it's possible to have an effective IS facility without satisfied users (Melone 1990).

The final problem is that investigation of user satisfaction instruments reveals some confusion about what has been measured (Galletta and Lederer 1989). For example, Doll and Torkzadeh (1988) developed one such instrument that was designed to measure user satisfaction. Etezadi-Amoli and Farhoomand (1991) found this instrument to be unreliable because it measured the frequency of satisfaction and did not provide a means to assess the relative importance of each item to the respondent. Four of the factors (Information Context, Accuracy, Format and Timeliness) related to information quality and one (Ease of Use) to system quality.

So how can the effective/successful performance of the three components (System Quality, Information Quality and Service Quality) be gauged? The obvious step is to look further at satisfaction, which DeLone and McLean had argued was the key variable, and at quality, which was the evaluative term they had attached to system and information. What is the distinction, if any, between these terms?

Satisfaction and Quality

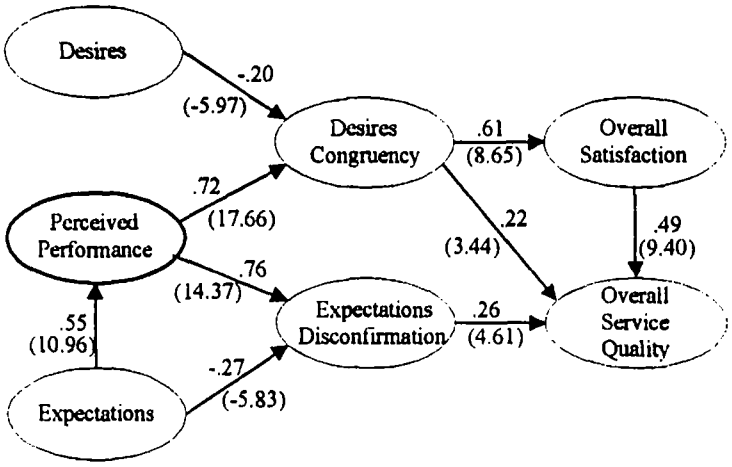
What is meant by these two terms is not always clear. At times customer satisfaction is claimed to precede quality (Parasuraman et al 1986); at other times to be its consequence (Cronin and Taylor 1992, 1994); and at other times the terms are used interchangeably (Parasuraman et al 1994).

Despite the lack of a definition of quality, DeLone and McLean's table of empirical measures implies a technical focus, using production terms like response times, resource utilisation and investment utilisation for system quality and product terms like accuracy, precision and completeness for information quality.

In an attempt to distinguish between satisfaction and quality, some have defined customer satisfaction in terms of the user's attitude or feeling as a result of a specific transaction or as a consumer's emotion related to a specific transaction (Oliver 1981). Further definitions have included "a subjective evaluation of the various consequences evaluated on a pleasant-unpleasant continuum" (Seddon 1997 p246) or as an "affective state that [was] the emotional reaction to a product or service experience" (Spreng and Mackoy 1996 p17-18). Quality was seen as a global judgement about a product's (or service's) overall excellence (Parasuraman et al 1986).

Spreng and Mackoy's (1996) empirical study investigated the proposition that satisfaction was the result of a comparison of perceptions of service received with expectations of what will happen (predictive expectations); and service quality was the result of a comparison of perceptions of service received with expectations of the service which the service provider should provide (ideal expectations or desires) (Spreng and Mackoy 1996). The study found that satisfaction and service quality were distinct constructs; that desires did affect satisfaction; that the disconfirmation of expectations (what will happen) did not significantly affect service quality; but that expectations did indirectly have a positive effect on service quality (through perceived performance) (see Figure 3).

Figure 3: Relationship between satisfaction and service quality (Source: Spreng and Mackoy, 1996 p209)



The conclusion was that **satisfaction** was the result of expectations of what will happen being disconfirmed by the perceived performance and that service **quality** was derived by comparison between desires (what should happen) and perceived performance.

So how does this relate to current research? Two of their findings suggest factors that need to be considered in future research.

- As desires had an impact, "managers should not believe that merely meeting (or exceeding) predictive expectations will satisfy consumers" (Spreng and Mackoy 1996 p210).
- Expectations did influence perceptions of performance and therefore needed evaluating.

Surely if the function of IS is as a tool to gain comparative or competitive advantage, the aim would be for maximum levels of performance. Hence, the quest for IS success should be focused on a horizon beyond merely what a stakeholder may think will happen, and rather on a further horizon like what should happen. Therefore, the measurement of quality, not satisfaction, should be the focus of IS effectiveness.

The more directly an instrument can measure what stakeholders know, the less the data has to be interpreted. If the issue is user stakeholder views of the quality of the system, information or service, why use surrogates like use or user satisfaction to measure it? Why not measure in terms of quality itself?

Defining Quality

Historically, the meaning of quality has altered considerably, from conformance to product and production to specifications (Levitt, 1972; Crosby, 1979); fitness for use (Juran et al, 1974); to value (Cronin and Taylor, 1992; Garvin, 1988); and meeting and/or exceeding customers' expectations (Gronroos, 1983; 1990; Parasuraman et al., 1984; Zeithaml et al., 1990; Buzzell and Gale, 1987).

Such changes are outlined in Table 2 (see below). In this context, it is the customers/ stakeholders who appear to be the driving force with their demands for higher performance requirements, faster product development and fewer defects (Kerzner, 1998; Davis and Meyer, 1998). The involvement of stakeholders in the evaluation and realisation of quality

Table 2: Changing Views of Quality (Source: Kerzner, 1998 p1042)

Past Understanding of Quality	Present Understanding of Quality
• Quality is the responsibility of blue-collar workers and direct labor employees working on the floor	• Quality is everyone's responsibility, including white-collar workers, the indirect labor force, and the overhead staff
• Quality defects should be hidden from the customers (and possibly management)	• Defects should be highlighted and brought to the surface for corrective action
• Quality problems lead to blame, faulty justification, and excuses	• Quality problems lead to cooperative solutions
• Corrections-to-quality problems should be accomplished with minimum documentation	• Documentation is essential for "lessons learned" so that mistakes are not repeated
• Increased quality will increase project costs	• Improved quality saves money and increases business
• Quality is internally focused	• Quality is customer focused
• Quality will not occur without close supervision	• People want to produce quality products
• Quality occurs during project execution	• Quality occurs at project initiation and must be planned for within the project

was best summarised by Iacocca (1988 p257), when he said, "quality doesn't have a beginning, or a middle. And it better not have an end. The quality of a product, and of the process in arriving at that product, has to go on and on to become part of every employee's mind set."

With such an understanding, there seems little distinction between quality as defined by user stakeholders and the definition of IS effectiveness as a "value judgement, made from the point of view of some stakeholders, about net benefits attributed to use of an information system" (Seddon et al., 1999 p1; Seddon et al., 1998; Grover et al., 1996). Accordingly, it would seem logical to use quality as the defining measure of IS success/effectiveness.

Redefining the IS Success Model

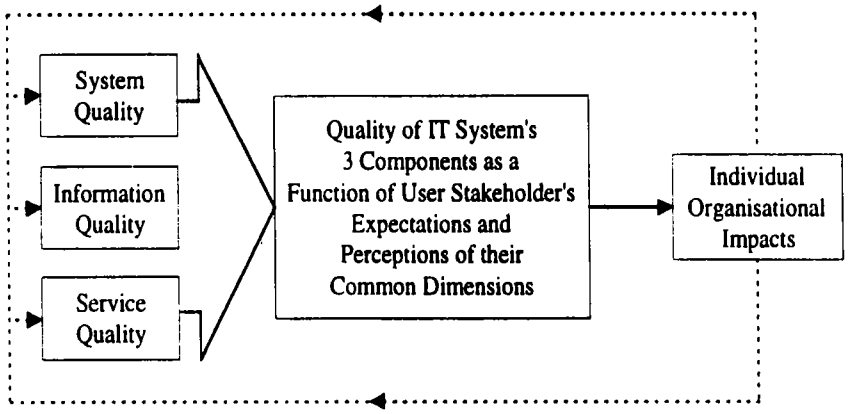
If the concept of quality was to be incorporated in the IS Success Model, then it should be positioned to provide the key information regarding the principal facets as they impact on both the individual and the organisation (see Figure 4). Accordingly the conceptual model which was developed here has quality as the evaluative mechanism/determinant of IS effectiveness.

Here quality is featured as the key determinant of IS success. Benefits of the model include:

- "acknowledgment of greater expertise among users and consideration of a broader audience, including customer views and organizational interests;
- the use of two key variables, expectations and perceptions, to identify underlying reasons surrounding the importance of a particular component;
- direct measurement of the key issues rather than through surrogates;
- provision of detailed information directly relevant to system, information and service quality;
- elimination of problems regarding interdependency; and
- a clear focus upon the functional effectiveness of IS, relevant to comparative and competitive advantage" (Wilkin and Hewett 1999).

With extensive growth in IT investment and concern that benefits might not be as high as expected, evaluation becomes a major concern. Moreover, given preference for the more

Figure 4: Quality as a component of an IS success model (with reference to user stakeholders)
Key: solid line arrows : variance
dotted line arrows : influence (Source Wilkin and Hewett 1999; Wilkin 2000)



customer focused definition, the next point of review is an approach by which such an evaluation can be achieved.

THE DEBATE: QUALITY = P – E

Quality has an elusive nature, and given the absence of objective measures "a useful and appropriate approach for assessing the quality of a firm's services is to measure customers' perceptions of quality. What we then need is a quantitative yardstick for gauging such perceptions" (Parasuraman et al., 1986).

Many practitioners and researchers see two key variables in the measurement of quality: perceptions and expectations. Here a measure of quality (denoted G) is derived by taking Expectations (E) away from Perceptions (P) i.e. G = P – E. Accordingly, the higher G, the better the level of quality, with high negative scores indicating low quality. Such an approach was considered a more sensitive measure than simply capturing the result using a single response (Perceptions only) (Parasuraman et al., 1986; Pitt et al., 1995; Wilkin and Hewett, 1997).

Three instruments evaluate quality by measurement of customer's expectations and/ or perceptions: SERVQUAL, SERVPREF and SERVIT (Parasuraman et al 1986, 1991, 1994; Cronin and Taylor 1992, 1994; Wilkin and Hewett 1997). The former two are highly regarded in marketing while the latter is a derivative for use in IS. To understand the merits and problems associated with the use of these respective instruments, it is necessary to explore the terms expectations and perceptions, together with the debate which is associated with their usage.

Expectations

Expectations, variously defined as desires, wants, normative expectations, ideal standards, desired service, and hoped for service (Teas, 1994), occur at two levels, predictive expectations and desires. When used predictively, expectations relate to something that will happen and hence are linked to satisfaction, but expectations of an ideal relate to desires or something that should happen and hence are linked to evaluation of quality.

There are at least four ways people's expectations are formed: word of mouth communications, personal needs, past experience and external communications, including price (Zeithaml et al., 1990). Certain reservations should be considered as circumstances arise to cause their over-inflation or under-inflation, thereby affecting the customers' final evaluations (Olshavsky and Miller, 1972; Szajna and Scamell, 1993).

Justification for including expectations (Cronin and Taylor, 1992; 1994; Teas 1993; 1994; Van Dyke et al., 1997) centred around the insight it provided about how users formulated perceptions or how significant such users saw each dimension or statement (Parasuraman et al., 1986; Pitt et al., 1995; Kettinger and Lee, 1997; Carman, 1990). Take the example of two users. Both may rank a statement at three with regard to their perceptions of performance, but if they both expected statement one to perform at 5 (G = 3 –5 = -2) and statement two at 7 (G = 3 – 7 = -4), then there's a distinct need to focus on statement two as an area requiring attention. As demonstrated, it was the *expectation* measurement that provided such insight.

Evident from the literature is that expectations of stakeholders are seen as essential to both understanding and achieving IS effectiveness. The concept's role in evaluation of quality/IS effectiveness has relevance, as through measurement of it as an ideal standard (the proposed means of measurement), more insight surrounding problematic areas within an organization is provided. Thus, in evaluating quality, the disconfirmation between expectations of ideal service and perceptions of reality is a less subjective, more global judgement encompassing a broader range of attributes than merely satisfaction. In this sense, measurement should be better than by use of the surrogates that other researchers have used, for example, an examination of adequacy of service (which equates to satisfaction).

A further complication concerns the different internal opinions held by different user stakeholders. Here too, unless expectations are measured as part of an evaluation of quality, a low or high perception rating could provide misleading information. Moreover, measurement of expectations provides insight regarding changes in system environment (Watson et al., 1998).

Perceptions

The perception's only measure has been proposed in both defining and evaluating quality. Believing that a measurement of service quality derived by the difference score only captured factors that were related to service quality and didn't measure customers' view of the concept itself, Cronin and Taylor (1992) proposed one which measured adequacy perceptions/importance. They argued this was the most efficient. Their justification concerned the fact that judgements of service quality and satisfaction appeared to come after evaluation of a service provider's performance.

As perceptions of delivered service are contingent upon prior expectations, they are shaped by the same four sources as expectations although additionally external communications including factors like pamphlets and advertising, are relevant. Moreover, it was found that perceptions of quality are based more heavily on perceptions of current performance than on actual service change (Bolton and Drew, 1991). However, as users are different and hence their knowledge, attitudes and methods of defining systems are different, such factors may potentially result in problems with measuring perceptions.

Support can be found for the view that a single measure of performance provides little information about a user's thoughts in relation to product features, nor does the process by which performance is converted into understandings by the consumer (Spreng et al., 1996; Oliver, 1989). Extrapolating, it can be assumed that use of expectations provides greater insight.

Dispute Regarding Expectations

Given the varying understanding of expectations, Teas (1994) argued that user interpretations would correspondingly vary.

Van Dyke et al (1997) argued that work by Teas (1993) and Boulding et al., (1993) revealed a number of different interpretations of expectations by users: a forecast or prediction, i.e., will; a measure of attribute importance (see Teas); and a classical ideal point, i.e., should. Further, they argued that it was found (Boulding et al 1993) that increased will expectations led to higher perceptions of service quality and increased should expectations led to lower perceptions. Some problems were removed when Parasuraman et al (1994) proposed expectations as a vector attribute. Here a customer's ideal point is at an infinite level, formalised with use of the word will rather than should.

Kettinger and Lee (1997) acknowledged some validity to the claim (Van Dyke et al., 1997; Teas, 1993; Boulding et al., 1993) that customers might variously interpret expectations. They used the ideal expectation format, basing this selection on material from Parasuraman et al. (1991) and Zeithaml et al. (1990).

A further issue concerned the fact that there might be confusion related to interpretation of expectations and that this confusion would be embedded in perceptions, which all researchers agreed were partly formulated from expectations (Kettinger and Lee, 1997).

Dispute Regarding the Gap Measurement

As SERVQUAL (a marketing instrument formulated by Parasuraman et al 1986) measured users' views of service quality by difference scores, i.e. its formulation was such that Service Quality (G) = Perceptions (P) – Expectations (E), criticism also related to the problems with difference scores.

Particularly influential in this regard was Peter et al (1993), who in discussing such statistical problems, cited examples of 13 researchers who investigated instruments that used difference scores. His findings revealed four key problems with such measurement.

1. Reliability. Peter et al., (1993 p658) claimed that difference scores were less reliable than their component variables such that as "the reliability of either (or both) component score decreases, the reliability of the difference score decreases." Van Dyke et al., (1997) supported the claim that as "the correlation between the component score becomes larger, the reliability of the difference score also decreases" (Peter et al., 1993 p658), a point made by Prakash and Lounsbury (1983) which they demonstrated mathematically.
2. Discriminant validity, where the term was used to describe the "degree to which measures of theoretically distinct constructs do not correlate too highly" (Peter et al., 1993 p659), is essential if the components of the measure were to have construct validity. They argued that because difference scores have lower reliability, there was an illusion that they possessed discriminant validity.
3. Spurious correlations, according to Peter et al (1993), related directly to this second discriminant validity problem. Because they felt there was a relationship between G, P and E, Peter et al. (1993) argued that the correlation between the difference scores was likely to be spurious. They felt the difference between two variables provided no more predictive or explanatory material than the two components themselves provided (i.e. G was no more useful than P and E), that often one component variable performed better than the equation (i.e., P was more accurate than G = P – E) and that the high correlation between G = P – E and P or E produced unstable parameters and misleading results.

4. Finally, there was a possible restriction of the variance of the difference score variable (Peter et al., 1993 p660). They argued that, since E was always better than P, there was a restriction on the range of scores available to those who felt that service quality was good, as opposed to the greater range of scores available to those who had lower perceptions. Thus, they reasoned that, since P would rarely equal or exceed E, users who were unhappy with service would have a greater range of difference scores than those who were happy.

Summary: Issues for Exploration in Empirical Study

With such controversy regarding the evaluation of quality in terms of perceptions and expectations, it seemed pertinent to conduct a small empirical study to look at certain key issues which related to evaluation of quality in an IS context, by user stakeholders. The principal issues were as follows:

Question 1. Whether such stakeholders structured an IS facility with the same three key components as hypothesised, namely System Quality, Information Quality and Service Quality.

Question 2. How such stakeholders then arrived at perceptions of the quality of a delivered IS function.

Question 3. Whether measurement of expectations and perceptions of quality at the same time provided a more or less accurate indication of IS Quality/Effectiveness than a perceptions only approach, as suggested by Caruana et al. (1999).

EXPLORATION OF THE ISSUE: A REAL LIFE TRIAL

In early 1999, the research work which was being undertaken, required empirical investigation of the merits of the conceptual model (Figure 4) and associated data for the formulation of an instrument by which to measure IS Quality/Effectiveness. The chosen methodology was to conduct at least four focus groups and a series of interviews with a broad range of IT professionals until consistent findings were evident.

The participants in the first two focus groups were very interested in the initial results and especially in their developed understanding of how stakeholders arrived at scaled scores for their perceptions of any one aspect of IS. Their enthusiasm and willingness encouraged this trial even though it was slightly outside the directional thrust of the general research. A few others volunteered to be involved as well.

Focus Groups/Interviews

The participants became involved by a process best described as a convenience sample, although they were not handpicked. Personal approaches to a number of firms resulted in some participants volunteering and/or being nominated by managers. Geographically, the spread was diverse, with interviews and focus groups conducted face to face in two capital cities and two regional centres, with one international contact. All were IS stakeholders who used a diverse range of delivered IS, with varying levels of seniority.

A series of four focus groups were conducted with a diverse range of stakeholders including academics, a client support officer, bookshop supervisor, national sales administration manager, and strategic development manager. Ten semi-structured interviews were conducted with a range of system developers including self-employed consultants, managers and corporate technical IS developers. Both the interviews and focus groups were aimed at ascertaining opinions about the meaning of quality; components of delivered

information systems/applications; critical aspects of the system or application, information or output and support/service; and the common themes used in assessing whether these aspects are up to standard.

Two results were abundantly clear at the end of the first two focus groups (undertaken prior to the empirical study reported in this chapter), and remained a unanimous finding throughout. Firstly, all participants agreed that fundamentally a delivered IS comprised three core elements:

- System including the physical system, software and manuals.
- Information generated both in print and electronic form.
- Service/support for user stakeholders, whether outsourced or in-house.

This obviously supported aspects of the respecified conceptual model. Secondly, all agreed that evaluation of the quality of delivered IS is made by comparison of reality with ideal perceptions compared with expectations in an assessment of quality. Thus $G = P - E$ seemed to be the intuitive/internal measure, which was used in assessing IS quality whether expectations were directly assessed or not.

The Instrument

At the end of the first two focus groups, a number of participants became involved in some informed discussion about what outcomes were sought from this research. They were very interested in the debate regarding whether measurement of perceptions only, or perceptions and expectations, was the most accurate method of evaluating stakeholders' views of IS quality/effectiveness.

At this point, although the proposed three sections for an instrument appeared to be justified (system quality, information quality and service quality), the data about the dimensions were inconclusive. So the instrument used was one in which the dimensions and relevant pointers had been hypothesised from the literature and from a previous set of interviews. Hypothesised dimensions in line with the service-related literature were: tangibles, reliability, responsiveness, assurance and empathy. The statements used for this trial had been carefully refined by these earlier interviews, with categorisation and ranking according to the methodology described by Davis (1989). The only change made to this early instrument was the deletion of the tangibles dimension, because findings from the first two focus groups were that:

- although somewhat inconclusive, the tangibles dimension was ranked less significant or low;
- some statements (help screen and interface) translated from service quality and Parasuraman et al's work were linked to responsiveness;
- two statements related to portability rather than tangibles, a dimension which also ranked poorly;
- results from prior studies rated the dimension of least significance and prone to causing problems (Pitt et al., 1995; Wilkin, 1996; Wilkin and Hewett, 1997); and
- elimination of 12 statements (4 statements times 3 components) had appeal, given the instrument's length.

Thus, the hypothesised dimensions could be defined as (Table 3):

The dimensions identified for the instrument were simple enough to address only a handful of related issues at a time. The quality in each dimension is measured by presenting users with descriptions of the issues involved and by asking them to provide assessments of the magnitude of any problems perceived. By combining these individual assessments, measures of quality in each dimension are obtained (and thus system, information, service and overall IS quality).

Table 3. Definition of Dimensions (Note: The tangibles dimension was deleted, but a definition of the dimension is provided here for reader understanding)

		Dimensions				
		Tangibles	**Reliability**	**Responsiveness**	**Assurance**	**Empathy**
Definition	**Service Quality** Parasuraman, Zeithaml & Berry & adopted by Wilkin	Appearance of physical facilities, equipment, personnel & communication material	Ability to perform the promised service dependably & accurately	Willingness to help customers and provide prompt service	Knowledge and courtesy of employees and their ability to convey trust and confidence	Caring, individual attention the firm provides its customers
	System Quality Wilkin	Appearance of user interfaces, useability of system documentation and convenience of the physical components of the system	Ability of the system to function reliably & efficiently, and produce accurately the requested results when promised & consistency of the technology	The flexibility and integration the system allows including ease of response to users' commands and ease of selection of system features in a timely manner	The capacity of the system to inspire trust and confidence in its reliability and security	The system's consideration of the specific needs of individuals such that stakeholders feel supported & comfortable when using the system
	Information Quality Wilkin	Appearance of reports or information generated in a manner which is readable, modern looking, appealing, attractive, and formatted	The extent to which the information is complete, dependable, delivered as promised and accurate on a consistent basis.	Ease of accessibility of information	The information produced can be confidently used due to its understand-ability, comparability & validity	The information makes the user's job easier, supports key aspects of the work, and enhances but does not replace human judgement

One issue explored in this study (Question 3) is the precise way to measure the magnitude of users' assessments of problems. Take for example a specific statement from QUALIT that is used in measuring the reliability dimension of system quality.

P1. My IS systematically checks and identifies errors

P1 is one of five statements in this dimension. Stakeholders provide a measure of quality of this aspect of their system, by giving a score for this statement on a standard scale "Strongly Disagree" (score = 1) to "Strongly Agree" (score = 7). How do they arrive at the score they get? Focus groups identified that in some way they compare their actual IS with some ideal system which systematically checks and identifies all errors. The ideal system would normally but not always get a perfect score of 7. Their system is compared with this, and a score is provided. The problem is that simply asking for perceptions does not necessarily force a user to make a comparison with an ideal system, and different results may occur if the issue is forced a little by actually asking for their expectations at the same time. Moreover, different users have different internal measures with respect to both perceptions and expectations.

Therefore, this trial used an instrument hereafter called QUALIT, an IS derivative of SERVQUAL, which comprised

- three components – system quality, information quality and service quality
- four dimensions for each of the three sections – reliability, responsiveness, assurance and empathy, i.e., 12 dimensions in all. Such dimensions enabled grouping of state-

ments so that key problems or issues were addressed in four or five ways to ensure that the issue was thoroughly explored.

- 18 statements for each section
  Reliability 5 statements
  Responsiveness 4 statements
  Assurance 4 statements
  Empathy 5 statements
- Each statement was phrased in two ways. One way asked for a user's perception of actual performance (Perceptions sections) and the other for user's expectations of how the ideal would be (Expectations section).

For example, an issue or problem would be addressed through a pair of statements (for Expectations, E; and Perceptions, P).

E9. The flexibility of excellent IS will enable users to complete tasks more efficiently.

P9. The flexibility of my IS enables me to complete tasks more efficiently.

The version that was distributed first comprised solely perception statements addressing all three components (system quality, information quality and service quality), while its successor contained both expectation and perception statements, addressing the same three components. QUALIT's format was straightforward using closed statements requiring the participant to make a choice amongst a given set of alternatives by circling a number between 1 and 7, strongly disagree to strongly agree. Furthermore, it contained no negatively worded items, as these generated awkwardness.

Figure 5: Distribution of respondent one's PE – P scores over all 18 system quality statements (Key: PE = Perceptions when measured with expectations and P = Perceptions only).

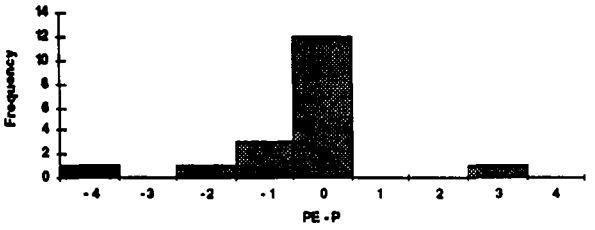


Figure 6: Distribution of respondent one's PE – P scores over all 18 information quality statements (Key: PE = Perceptions when measured with expectations and P = Perceptions only).

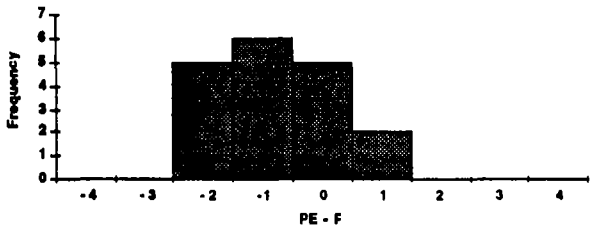
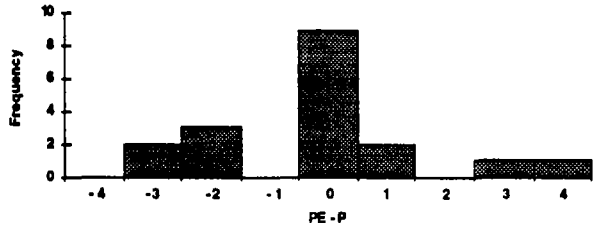


Figure 7: Distribution of respondent one's PE – P scores over all 18 service quality statements (Key: PE = Perceptions when measured with expectations and P = Perceptions only).



The Trial

Participants were all volunteers and were IS stakeholders from a wide range of occupations including administration, education, human resources, retail and professional writing sectors, who used a variety of IS. All were skilled end-users.

The initial Perceptions only version of QUALIT was administered via mail. To enhance response rates, a reminder was sent to non-respondents a week later. Two weeks after the receipt of completed questionnaires, the perceptions and expectations version was sent. Such a time lapse was deliberate for it was hoped that sufficient time had elapsed for respondents to forget specific answers to questions, but insufficient time for influential variables like training, to impact on results.

To enhance consistency, respondents were directed to complete both questionnaires with the same system in mind, a process facilitated through collection of system details in

stage one, so that cover pages in stage two could be customised.

Response rates for the respective stages were relatively high, 86.66% and 76.92%, providing a total of 20 usable questionnaires. Although restrictive, the trial produced interesting findings.

4. Results

In interpreting these results, the perceptions only scores are denoted by P and the perceptions obtained when expectations were also evaluated, by PE. For each question, the difference between the scores, PE - P, provided by each respondent without expectations being measured, were determined.

Given that P and PE were on a 1 to 7 scale, it is possible for PE – P to be as large as 6 and as small as –6, but if measuring Expectations had no effect on Perceptions, values of PE – P would be close to zero. However they are not always. Figures 5, 6 and 7 show the distribution of the values of PE - P for a typical (randomly selected) respondent. For this respondent, the values of PE - P varied from a minimum of –4 on one question (on system quality) to +4 for another question (on service quality). This was typical and shows that evaluation of expectations affects measurement of perceptions for some questions and respondents.

Figure 8: Respondent-by-respondent mean difference for system quality between perceptions when measured with expectations (PE) and perceptions only (P) showing ±2 Stderr

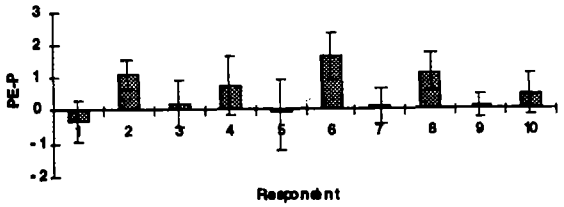


Figure 9: Respondent-by-respondent mean difference for information quality between perceptions when measured with expectations (PE) and perceptions only (P) showing ±2 Stderr

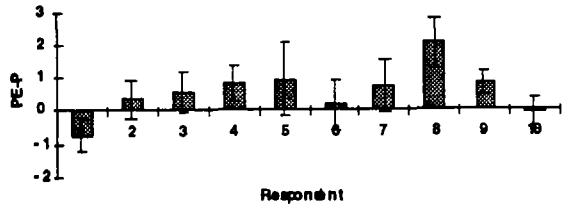
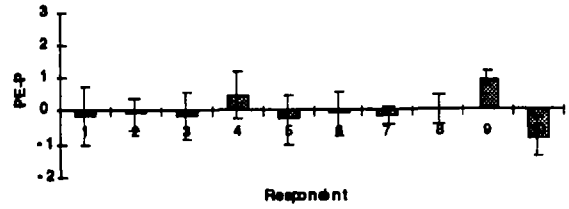


Figure 10: Respondent-by-respondent mean difference for service quality between perceptions when measured with expectations (PE) and perceptions only (P) showing ±2 Stderr



As described earlier, a tally of the Perception scores for the corresponding statements will provide a measure of quality. Again this can be done for perceptions with and without expectations being evaluated. Figures 8, 9 and 10 show the average change in the quality measurements for each participant, component-by-component (the average change is simply the average of the difference scores, PE - P, for each respondent, and is denoted as such in the charts).

It can be seen that some respondents gave much the same quality ratings whether or not expectations were determined. These are the ones where the average changes, PE – P, are close to zero. Most respondents were in this category when rating service quality for example. But it can also be seen that many respondents gave quite different ratings when expectations were determined. There is a definite trend that evaluating expectations inflates the perceptions scores, thus resulting in higher quality scores. This is most pronounced in the information quality section. The mean change in quality ratings taken over all participants reflects this (see Table 4).

The previous analysis shows that the perceptions scores are affected if expectations are evaluated at the same time. This is not particularly surprising. The most interesting and important issue is whether or not the quality ratings obtained using perceptions only are any

different from those obtained by measuring the gap i.e. G = P–E. Of course a difference here means a difference up to a uniform scale factor, that is up to a linear transformation. There is nothing absolute about the ratings obtained from either the P or the P-E version.

Table 4: Mean Difference Between Perceptions when Measured with Expectations (PE) and Perceptions Only (P)

Component	Mean
System Quality	0.49
Information Quality	0.56
Service Quality	-0.04

Using the data from the PE trial, the gap was determined for each statement pair and each participant. In Figures 11, 12 and 13, these scores are plotted against the corresponding perceptions score, component by component. NOTE: to facilitate readability, the gap (derived by taking perceptions away from expectations) has been rescaled to a positive score by adding 7 and dividing by 2.

It is quite clear from Figures 11, 12 and 13 that as the perceptions only score increases, so too does the gap score. However, the relationship is far from strong and one would certainly not be able to use perceptions only as a surrogate for the gap or vice versa: it is possible to get a high perception rating and virtually any score for the gap for example. The conclusion is that, although related, the gap and perceptions measure alone are different measures of quality.

CONCLUSION

Much work has been done to improve the technical quality of delivered IS, but there is a need to focus on effectively managing or evaluating this in humanistic terms. Given that surely the most knowledgeable source of information about the effectiveness of the function of the system, the information it generates and/or support services IS deliverers, is user stakeholders, then collation of their myriad views in an objective, quantitative and structured manner to match the principal facets (system quality, information quality and service quality), creates an opportunity to evaluate IS effectiveness.

Figure 11: System quality scatter plot with regression line

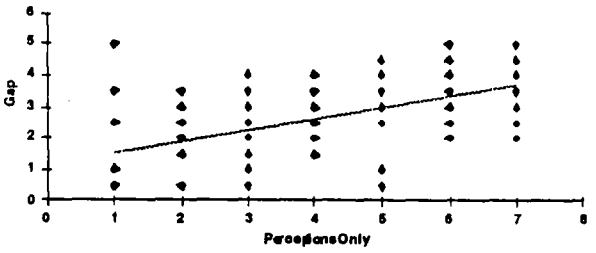


Figure 12: Information quality scatter plot with regression line

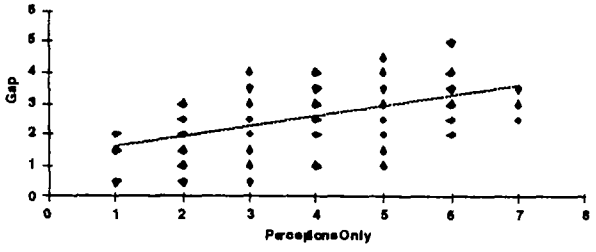
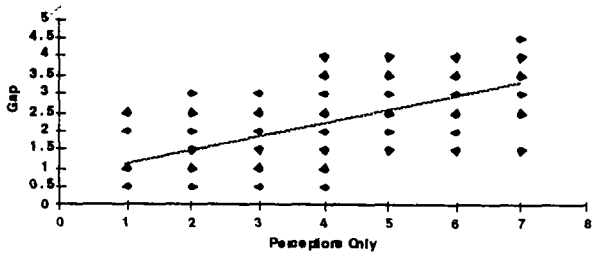


Figure 13: Service quality scatter plot with regression line



What this exploration has done is provoke of a number of questions that require further investigation. Although the answers aren't clear, there's enough evidence to ask two questions.

- In an evaluation of IS quality/effectiveness, does measuring perceptions and expectations at the same time mean perceptions are more valid than when perceptions only are measured? alternatively, does measuring perceptions only result in more accurate perception scores and thus a more valid measure of IS quality/effectiveness?
- Given the deliberation about expectations and perceptions, is the gap measurement (i.e. G = P – E) a more/less

accurate measure of IS effectiveness than the perceptions only measure?

What is clear from the findings is that participants' evaluations of expectations tempered their perceptions scores to a significant unpredictable degree.

Possibly the most interesting outcome would be in ascertaining which method (perceptions or perceptions minus expectations) gives a more valid measure of quality. Exploration of this could be achieved using triangulation with interviews or an alternative questionnaire. As the effect of expectations on perceptions was only discovered after completion of this trial, triangulation such as that proposed above was not possible, as results came in so slowly that too great a time lapse could have invalidated results.

Considering the trial and results, a reasonable inference is that there really isn't any neat solution to the debate. The issue is more concerned with both benefits and problems. With that aside, given the effect of expectations on perceptions is not only indefinitive but unpredictable (not to mention the significant data expectations provides), there seems to be business value in measuring both. With the growth of the IT industry, and the increasing need for organisations to make better and better returns on investment to retain their comparative and competitive positions, there is a need to focus on such issues.

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the first tier of the framework. This alteration of the positioning or geography of the BSC provides the means to link the financial measures into the customer themes as expressed in the strategic vision and goals. Customers are not stratified for the government organization, and the strategic goals are stated in terms of thematic success relative to the customer base.

The third key practice, creating target measures, results, and accountability at decision-making tiers, provides an insight into the impact of BSC differences. Decision-making criteria polarize around financial issues for both types of organization. Therefore, the differences for the two types of organizations in applying the BSC are predominantly related to the duality of the financial goal structure and are evidenced in many aspects of the BSC implementation. Financial measures for industry focus on outcome measures. Financial measures for government focus on both leading and lagging indicators. This difference becomes obvious when the decision structure of the two types of organizations are evaluated. A government organization is constrained by issues of cost and cost containment, while industry is focused on profitability.

The fourth key practice, building a comprehensive measurement, data collection, and analysis capability is impacted the least by whether an organization is governmental or industrial. This key practice is more a factor of the organizational structure, degree of automation in core business processes, and degree of decentralization of operations.

The fifth key practice, strengthening IT processes to improve mission performance, requires that both types of organizations apply appropriate technologies in achieving their missions. For industry this aspect is critical as it often separates the industry leaders from their competitors.

There are more subtle differences between industry and government organizations that will require additional investigation. One area of interest is the viability of reducing BSC implementation costs through documentation vehicles and leveraging of historical organizational knowledge. Another research focus that might prove extremely fruitful is development of a corollary framework to the measurement framework identified for financial measures. The financial measurement framework provides a three level hierarchy of objectives, qualitative characteristics and elements, and recognition and assumptions. There currently is no such measurement framework for the customer perspective, the internal business process perspective or the learning and growth perspective. This is identified as an open measurement issue requiring further research.

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