Measuring Electronic Service Quality Gaps
In The Australian Wine Industry

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Electronic service quality, e-SQ, wine industry, customer satisfaction, gap analysis, gap measurement

Abstract

It has been proposed that the elimination of electronic-service quality (e-SQ) gaps holds the key to a better website experience when dealing with organizations on-line. In turn, this leads to increased perceived e-SQ, perceived value, and importantly purchases and repurchases. In this paper a method of measuring e-SQ gaps is proposed. Regression and coefficient analysis are used to analyse data collected from the relevant entities to first determine the existence of e-SQ gaps and then to measure the size of the gaps. This innovative way of measuring e-SQ gaps was tested on a study of Australian wineries and found to be effective.

1 Introduction

The importance of electronic service quality (e-SQ) is highlighted by Zeithaml, Parasuraman and Malhotra [2002] who claim that the elimination of e-SQ gaps will lead to customer satisfaction which results in increased perceived e-SQ, value, purchases and repurchases. In this paper a method of identifying and measuring e-SQ gaps is proposed.

This method was used in an extensive study of Australian wineries by Davidson as part of a PhD research project and was found to be effective in identifying and measuring e-SQ gaps. The theory behind the gap analysis, the proposed measurement scale, and an example of its use from the Australian winery study is presented in this paper.

2 Electronic Service Quality Gaps

2.1 Zeithaml et al.'s Conceptual Model

Electronic service quality (e-SQ) is defined by Zeithaml et al. [2000] as "the extent to which a Web site facilitates efficient and effective shopping, purchases and delivery of products and services". In this definition the meaning of service includes both pre- and post-website service aspects.

Zeithaml et al. [2002] identifies four e-SQ gaps: the information, design, communication, and fulfilment gaps. The information gap represents the difference between customer website requirements and managements' beliefs about those requirements. The design gap represents the

failure to fully incorporate knowledge about customer requirements into the structure and functioning of the website. The communication gap represents the inaccurate or inflated promises about a website made through traditional media and on the website itself, and the fulfilment gap represents the discrepancy between customer requirements and experiences (what they actually receive). The fulfilment gap stems from the cumulative effects of the information, design and communication gaps. These gaps are illustrated in Figure 1. Zeithaml et al.'s [2002] conceptual model of understanding and improving e-SQ is a refinement of an earlier and well-accepted conceptual model of service quality (SQ) [Parasuraman, Berry, & Zeithaml, 1991]. The earlier model was set in the context of traditional SQ, while the revised model focuses on shortfalls in businesses interacting with their customers through the Internet.
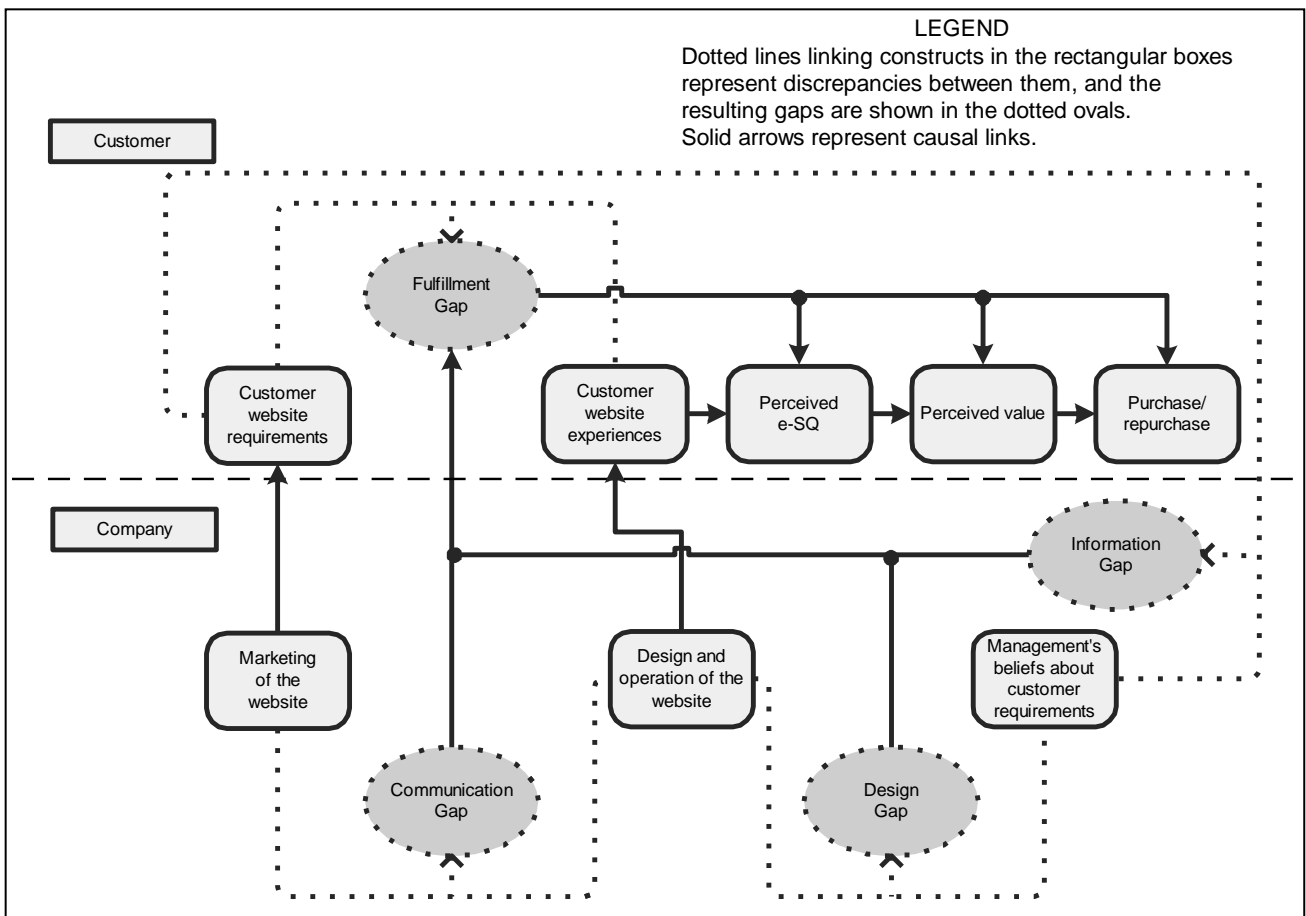

Figure 1: Conceptual Model for Understanding and Improving e-Service Quality [Zeithaml et al., 2002]

Zeithaml et al., [2002] claim that the elimination of e-SQ gaps will result in a better website experience for customers, with the expectation of experience being based on the customers' website requirements. The creation of satisfied customers will lead to greater perceived e-SQ, value and ultimately purchases and repeat purchases.

2.2 Formal Definition of e-SQ Gaps

When there is no information gap present, managers know exactly what customers require and there is a perfect positive relationship between customer requirements and managements' beliefs

about customer requirements. Therefore, in a situation where there is no information gap, if customers are presented with a list of possible requirements and asked to rate the importance of each and managers are given the same list of requirements and asked to rate their beliefs about customer requirements, the ratings would match. Similarly, there will be no design, communication, and fulfilment gap when there is a perfect positive relationship between:

- managements' beliefs about customer requirements and the design and operation of the websites;

- the design and operation of the website and the marketing of the website; and

- the customer requirements and experiences.

These relationships can be shown graphically. The scatter plot in Figure 2 represents a 'no gap exists' situation and the scatter plots in Figure 3 represent 'gap exists' situations.
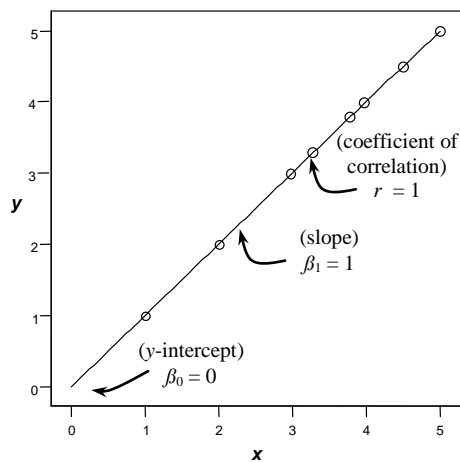

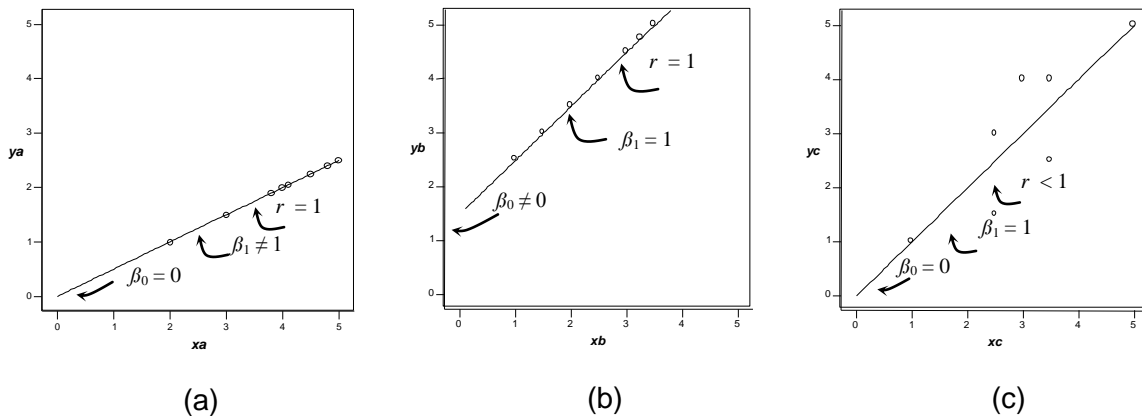Figure 2: Scatter Plot Representing 'No Gap Exists'

| (a) | (b) | (c) |

Figure 3: Scatter Plots Representing 'Gaps Exist'

The x and y-axis in these graphs represent the customer requirements, managements' beliefs about customer requirements, design and operation of the website, and marketing of the website depending on which e-SQ gap is under consideration (Table 1). The scale of the x and y-axis is the rating obtained for each variable. The actual variables plotted will depend on the individual situation under examination. In the example given in Section 4 of this paper, the variables used were based

on a specially developed website design framework for the Australian wine industry [Davidson, 2002 & 2003].

E-SQ Gap	X	Y
Information Gap	Customers requirements	Managements beliefs about customer requirements
Design Gap	Managements beliefs about customer requirements	Design and operation of website
Communication Gap	Design and operation of website	Marketing of the Website
Fulfilment Gap	Design and operation of website	Customers requirements

Table 1: *x* and *y*-axis Labels

The position of the *y*-intercept (β_0), the slope of the regression line (β_1), and the coefficient of correlation (*r*) influence the existence and extent of a gap. In a perfect positive relationship no gap exists and the line of regression intercepts the *y*-axis at zero ($\beta_0 = 0$), has a slope of one ($\beta_1 = 1$), and a coefficient of correlation of one ($r = 1$). Any deviation from these three conditions will represent the presence of a gap. Technically, *r* should equal 1, (as well as $\beta_0 = 0$ and $\beta_1 = 1$) for a perfect relationship. However, it is unusual for all data to occur in a straight line [Zar, 1999] which would result in the condition $r = 1$ never being satisfied when in fact it could be very close. Therefore, a threshold for *r* is set at 0.75 as recommended by Zar [1999]. Hence the $r = 1$ condition becomes $r \geq 0.75$ and any *r* value that is significantly less than 0.75 results in a rejection of the condition. Mathematically 'no gap' and 'gap' situations can be expressed as:

- There is no gap when all of $r \geq 0.75$, $\beta_0 = 0$, and $\beta_1 = 1$ hold true.

- There is a gap when least one of $r < 0.75$, $\beta_0 \neq 0$, or $\beta_1 \neq 1$ hold true.

3 Statistical Tests and Measurement of the e-SQ Gaps

3.1 The Existence of an e-SQ Gap

To test if an e-SQ gap exists, simple linear regression is used to determine the relationship between the pairs of variables. To test for H_0: $r \geq 0.75$, Fisher's [1915, cited in Zar, 1999] *r* to *z* transformation is used with a one-tailed test and a critical value of $Z_{\alpha(1)\infty} = t_{\alpha(1)\infty} = 1.6449$. For ease of understanding and consistency with the tests for β_0 and β_1 the 95% confidence interval for *z* is calculated then transformed back to an upper and lower limit for *r*. Therefore, for H_0: $r \geq 0.75$ and H_1: $r < 0.75$, if the upper or lower bounds of the 95% confidence interval are greater than or equal to 0.75, accept H_0.

The tests for the slope and *y*-intercept use the 95% confidence interval for β_1 and β_0 respectively. For H_0: $\beta_1 = 1$ and H_1: $\beta_1 \neq 1$, if 1 falls within the upper and lower bounds of the 95% confidence interval, H_0 is accepted. For H_0: $\beta_0 = 0$ and H_1: $\beta_0 \neq 0$, if 0 falls within the upper and lower bounds of the 95% confidence interval, H_0 is accepted. In summary:
- H_0: $r \geq 0.75$ is true if   *L* or $U \geq 0.75$;
- H_0: $\beta_0 = 0$ is true if $L \leq 0 \leq U$; and
- H_0: $\beta_1 = 1$ is true if $L \leq 1 \leq U$.

A level of significance of 0.05 was chosen for this research, as 0.05 is the most conventionally accepted level for most business research [Cavana, Delahaye, & Sekaran, 2001]. Thus, there is a 5% chance of making a Type I error of rejecting H_0 and declaring there is an e-SQ gap when in fact there is not.

3.2 Extent of the e-SQ Gap

A formula, which uses the values of r, $\text{\ss}_0$, and $\text{\ss}_1$, for calculating the extent of the e-SQ gap was devised and is given in Equation 1.

$$ Đ = \left(\left((1 - r^2) \times 0.5 \right) + \left(\frac{|\beta_0|}{5} \times 0.25 \right) + \left(\frac{|(\beta_1 - 1)|}{4} \times 0.25 \right) \right) \times 100 $$

Equation 1: Measurement of Discrepancy

In this formula r is squared to give the coefficient of determination. Each of the values, r^2, $\text{\ss}_0$, and $\text{\ss}_1$ are converted to an absolute value between zero and one based on the minimum and maximum values possible. It is an absolute value because the deviation away from the perfect positive position is important and not the direction in which it has deviated. Each of these is then weighted. The y-intercept and slope ($\text{\ss}_0$ and $\text{\ss}_1$) which represent the agreement between the variables is given 50% in total – 25% each, and the coefficient of determination (r^2) which represents the precision of the agreement between the two variables, is given 50%. These weighted values are added and multiplied by 100 to give the final discrepancy score, denoted by $Đ$. Zero and 100 are used as the extreme points simply to aid understanding by the user, where zero indicates no gap and 100 indicates a complete gap. In Figure 4 descriptions of the extremes for each of the four gaps are given.

To determine the appropriate weightings a sensitivity analysis was conducted using various combinations of weightings and applied to the data collected for the Australian winery study. After taking into consideration the cumulative effect that the information, design, and communication gaps have on the fulfilment gap, and the size of the resultant gaps using various combinations of weightings, it was felt that the above weighting gave the most logical results. The difference between the sum of the information and design gaps and the fulfilment gap was minimised. Unfortunately, the communication gap was not included in the Australian winery study, which created an unknown factor. In addition, precision and agreement are considered to be equally important, if each of r^2, $\text{\ss}_0$, and $\text{\ss}_1$ were given an equal weighting it would result in agreement having a weighting of 66.6% and precision 33.3%. Further research will be conducted to confirm the appropriateness of the weightings.
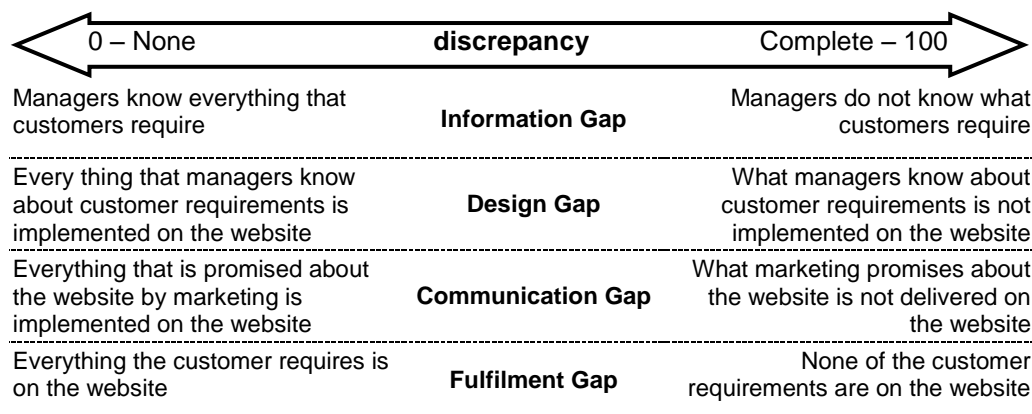
0 – None	**discrepancy**	Complete – 100
Managers know everything that customers require	**Information Gap**	Managers do not know what customers require
Every thing that managers know about customer requirements is implemented on the website	**Design Gap**	What managers know about customer requirements is not implemented on the website
Everything that is promised about the website by marketing is implemented on the website	**Communication Gap**	What marketing promises about the website is not delivered on the website
Everything the customer requires is on the website	**Fulfilment Gap**	None of the customer requirements are on the website

Figure 4: Description of Extreme Gaps

The relationship between r, $ß_0$, and $ß_1$, and $Đ$ is illustrated in Table 1. It can be seen that when there is a perfect positive relationship and $r = 1$, $ß_0 = 0$, and $ß_1 = 1$, there is no gap and $Đ = 0$. Conversely when conditions change and r moves towards zero, $ß_0$ moves towards ± 5, and $ß_1$ moves towards –3 or +5 (–3 and +5 do not appear symmetrical but are 4 steps away in each direction from the perfect positive relationship position of $ß_1 = 1$), $Đ$ moves towards 100, indicating a complete gap. The values of $r = 0$, $ß_0 = \pm 5$, and $ß_1 = $ –3 or +5 are the upper and lower bounds that can be obtained.

	Precision (coefficient of determination)		Agreement (intercept)	(slope)	(a)	(b)	(c)	E-Service Quality Gap Discrepancy $Đ$ ((a x 0.5)+(b x 0.25)+ (c x 0.25)) x 100
	r	r^2	$ß_0$	$ß_1$	$1 - r^2$	$\|ß_0\| / 5$	$\|(ß_1-1)\|/4$	
Complete gap	0.00	0.00	-5.00	-3.00	1.00	1.00	1.00	100.0
3/4 gap	0.50	0.25	-3.75	-2.00	0.75	0.75	0.75	75.0
1/2 gap	0.71	0.50	-2.50	-1.00	0.50	0.50	0.50	50.0
1/4 gap	0.87	0.75	-1.25	0.00	0.25	0.25	0.25	25.0
No Gap	1.00	1.00	0.00	1.00	0.00	0.00	0.00	0.0
1/4 gap	0.87	0.75	1.25	2.00	0.25	0.25	0.25	25.0
1/2 gap	0.71	0.50	2.50	3.00	0.50	0.50	0.50	50.0
3/4 gap	0.50	0.25	3.75	4.00	0.75	0.75	0.75	75.0
Complete gap	0.00	0.00	5.00	5.00	1.00	1.00	1.00	100.0

Table 1: Relationship Between r, $ß_0$, $ß_1$, and $Đ$

4 A Practical Example

4.1 Australian Wineries

Davidson used this method of determining the existence and extent of e-SQ gaps in a comprehensive study of Australian wineries [Davidson, 2004; Davidson & Cooper, 2005]. This study used a portion of Zeithaml et al.'s [2002] model by focusing on customer requirements, managements' beliefs about customer requirements, and website design and operations. An on-line survey, underpinned by a website design framework developed for Australian wineries [Davidson, 2002, 2003] was used to ask winery managers and winery website users to rate 90 website features on a five-point number scale with two polar positions (1-not important to 5-very important). 171 winery managers and 358 customers provided usable responses. In addition, 260 winery websites were evaluated for the existence of these features. The results of each of the three data collections were analysed using regression analysis and the statistical tests described above. It was found that an information, design, and fulfilment gap did exist.

The relevant statistical measures and calculated $Đ$s are given in Table 2 and illustrated in Figure 5. It can be seen that winery managers have a good indication of what customers require (information gap of 9.6), however customer requirements are generally not being implemented on winery websites (design gap of 39.9), which results in customer dissatisfaction (fulfilment gap of 60.0).

	Precision (coefficient of determination)		Agreement		(a)	(b)	(c)	E-Service Quality Gap Discrepancy Đ
	r	r^2	β_0 (intercept)	β_1 (slope)	$1 - r^2$	$|\beta_0| / 5$	$|(\beta_1-1)|/4$	$((a \times 0.5)+(b \times 0.25)+ (c \times 0.25)) \times 100$
Information Gap	0.922	0.850	0.313	0.910	0.150	0.063	0.023	9.6
Design Gap	0.542	0.294	-0.659	0.794	0.706	0.132	0.052	39.9
Fulfilment Gap	0.431	0.186	2.982	0.298	0.814	0.596	0.176	60.0

Table 2: Australian Winery E-Service Quality Gap Scores

Australian Winery E-Service Quality Gaps

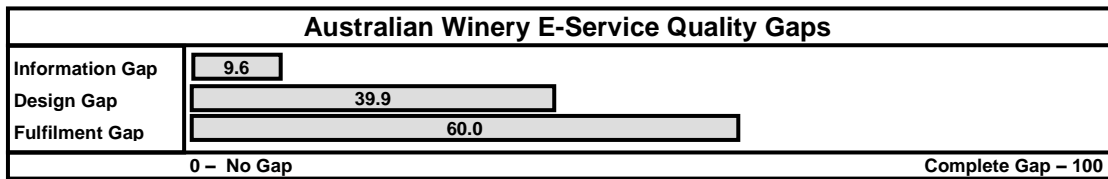|	
Information Gap	9.6
Design Gap	39.9
Fulfilment Gap	60.0

0 – No Gap　　　　　　　　　　　　　　　　　　　　　　Complete Gap – 100

Figure 5: Australian Winery E-Service Quality Gaps

4.2 Practical Implications and Further Research

Theoretically, decreasing the information and design gaps should have the flow through effect of decreasing the fulfilment gap, hence increasing customer satisfaction, which should ultimately lead to increased purchases and repurchases. Winery managers and their website developers can use this knowledge to create or improve their websites. It must be remembered that the results show that as an industry, managers generally know what is required but do not implement it on websites. At an individual winery level, managers and websites will differ; hence the list of contributing items will differ for each winery. Therefore, individual winery circumstances and the complete list of customer requirements need to be taken into consideration, not just the items identified as contributing to the industry gaps.

The design framework that formed the basis of the website evaluations and customer and manager surveys lays the groundwork for an extensive list of customer requirements that winery managers could use when designing a new website or upgrading an existing one. This framework is currently being refined and will be the subject of a future paper. In addition, the Winemakers Federation of Australia, the peak controlling body of the wine industry in Australia, have expressed interest in this framework and the making of an interactive checklist and report generator that winery managers can use to analyze their own websites to guide them in creating a more effective Web presence.

In addition, it should be possible to develop a framework for any industry and use this method of e-SQ gap analysis. This has the potential to provide practitioners in any industry with a guide on which to develop and improve their web presence.

A further area of research concerns the communication gap. The communication gap was excluded from the Australian winery study, as it required a different research methodology and data collection from the other gaps. A method needs to be established to determine this gap, and to calculate a discrepancy score on a similar scale to what is used in this research. It is expected that linear regression and the discrepancy formula could be used, but the data collected and rating of characteristics will differ. Given that Zeithaml et al. (2002) claim that the information, design, and communication gap all have a cumulative effect of the fulfilment gap, it would be particularly interesting to determine if the sum of the information, design, and communication gaps equal the fulfilment gap.

5.Conclusion

A way of measuring e-SQ gaps on a scale of 0 (no gap) to 100 (complete gap) has been developed which enables easy comparison and visual representation. In the Australian winery study that this method was tested on it was discovered that an information gap of 9.6, design gap of 39.9, and a fulfilment gap of 60.0, out of a possible 100, exists. This means that winery managers have a reasonable idea of what customers require on winery websites but these requirements are not always being implemented on the actual websites, which according to Zeithaml et al. [2002] leads to customer dissatisfaction. Armed with this knowledge, along with a detailed list of factors contributing to the e-SQ gaps, winery managers and their website developers can work towards closing the gaps and increasing customer satisfaction, provided they think the benefits outweigh the costs.

The winery website framework upon which the surveys and evaluations were made is being refined, and together with the discrepancy formula has the potential to provide the backbone of an interactive web based program. This program will produce reports for individual wineries, which may help them to establish a more effective web presence.

From a scholarly perspective the following contributions have been made:
- e-SQ gaps have been defined mathematically.
- A method of statistically testing for the existence of e-SQ gaps has been developed.
- A method of measuring the extent of e-SQ gaps has been devised.
- Part of Zeithaml et al's (2002) conceptual model of understanding and improving e-SQ has been tested.
- An agenda for further research has been developed.

This research has contributed in both a practical and scholarly manner and has the potential for wide ranging industry application. Following up on the further research opportunities provides both a challenging and interesting future for the researcher.

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