

An Exploration of the Hygiene and Motivator Aspects of WebQual Constructs in Predicting Website Reuse

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Abstract

Most existing studies of website characteristics and their impact on intentions have assumed a linear relationship between them. However, motivational theories suggest that while some characteristics have linear effects, others will act as either hygiene factors or motivator factors and have non-linear effects. Drawing on motivational theory and WebQual constructs, this study looks at different methods of testing for hygiene and motivator factors and proposes a different technique that could clarify misleading results. Linear regression, quadratic regression, and piecewise regression are used in the study. The results show the hygiene effect of trust and suggest that piecewise linear regression may be superior to quadratic regression in this context.

1. Introduction

Since the Internet entered mainstream commercial activity, websites have become a critical component of the rapidly growing phenomenon of e-commerce. Website-based services offer great benefits such as more information, ease of use, easier transaction processes, and increased control. Consequently, e-commerce has grown rapidly and become a major focus of many businesses.

One of the biggest concerns for e-commerce businesses is attracting customers to their website, keeping them there, and motivating them to revisit or purchase. Website quality research is focused on identifying the significant factors that influence customers' attitude and behavior (more particularly intentions to revisit and/or purchase from particular websites).

Virtually all the research on website characteristics and their impact on intentions has assumed a linear relationship between those characteristics and intention.

On the other hand, motivational theories [3, 12] suggest that while some characteristics will affect human behavior in a linear fashion (about the same impact due to increases when at a low level as when at a high level), often characteristics will act as either hygiene factors or motivator factors. Hygiene factors will cause dissatisfaction and dissuade individuals from a behavior if they are not present in at least a minimum amount, but don't have as much impact above a certain point. Motivators will cause satisfaction and encourage action when they are present at a high level, but don't have as much impact at a low levels.

This study makes two contributions -- one in the domain of website quality and impact on reuse, and the other in the domain of testing for hygiene and motivator impacts. First, we explore the possibility that in predicting Web site reuse, certain characteristics of websites are hygiene factors and others are motivators. This can have important implications for those interested in allocating design resources to websites. Secondly, we look at different ways of testing for hygiene and motivator factors in general and propose more helpful techniques that have the potential for clarifying some possibly misleading results.

The paper is organized as follows. The next section is the literature review of motivational theories in organizational research and why they should be applicable to Web site evaluation and Web site use research. The third section describes the empirical study methodology and the research findings, along with some questions they raise. In response to these questions, some follow-on analyses are done in a search for a more appropriate approach to testing for hygiene and motivator factors. Finally, the last section presents implications of the findings, some limitations, and conclusions.

2. Motivational theories and web site reuse

Motivation is people's eagerness and willingness to do something without needing to be told or forced to do it. It is one of the major psychological variables that determine human behaviors. In organization behavior and marketing research, motivation is widely associated with satisfaction, which is defined as "need fulfillment response" [14]. The origin of the theories on human motivation can be traced to the Maslow theory. Maslow's [12] propositions state that human needs are ordered in a hierarchy; that is they range from lower-order to higher-order needs. As one need is adequately fulfilled, the individual moves to the next higher-order need. Maslow specified these needs as: (1) physiological needs, the sustenance requirement of the human body; (2) safety needs, freedom from threat of body or mind; (3) social needs, the needs to develop close association with others; (4) esteem needs, the needs to have prestige; (5) self-actualization needs, the needs for self-fulfillment and accomplishment through personal growth and development.

The empirical works and reviews that appeared after the Maslow published his theory generally don't support the Maslow hierarchy very well. To maintain the central idea but simplify the categories, Alderfer [3] condensed Maslow's needs categories into those of existence, relatedness, and growth. Existence needs are similar to Maslow's physiological and safety needs category. Relatedness needs are similar to social needs and esteem needs. Growth needs correspond to the self-actualization category. The reduced number of need categories found more empirical support than the Maslow theory [3, 4, 18].

In a further condensation, Herzberg further collapsed Alderfer's categories to a two-level hierarchy -- Herzberg's Dual-Factor Theory. Herzberg suggested that two categories of factors had separate and distinct influences on workers' satisfaction [9]. "Hygiene factors" should only cause dissatisfaction in their absence, and they have no satisfying consequences when fulfilled. In contrast, "motivators" serve to satisfy and motivate people and their absence doesn't cause dissatisfaction. Motivators are generally intrinsic factors of fulfillment [14]. Herzberg's theory was a departure from the traditional approach that viewed job satisfaction and dissatisfaction as being on opposite ends of the same continuum.

Oliver [14] expanded on this theory by including a third set of "bivalent" factors that motivate goal pursuit regardless of the level of fulfillment. In other words, bivalent factors have an approximately linear relationship with the target behavior or attitude.

Drawing on these motivational theories, Agustin and Singh [1] proposed that the different determinants of customer loyalty intention had different curvilinear effects on loyalty, and these can be captured by quadratic regressions. The logic of the method is that effects of intention determinants can be depicted by a quadratic function containing both significant linear and quadratic effects [1]. The quadratic terms in such a function are an embodiment of the motivator or hygiene behavior suggested by Herzberg, and can be modeled by quadratic regression. Thus the curvilinearities in Agustin and Singh's study involve either increasing or decreasing incremental effects on loyalty intentions.

In addition to organization behavior and marketing research, the motivational theories reviewed above (although rarely the hygiene/motivator distinction) are also applied in the field of information systems (e.g. [7, 11, 19]).

2.1 Research predicting web site use

A website is a special type of information system. Users can seek, retrieve, and apply information displayed in a website. Adopting the technology of a website really means that users revisit the website or make transactions using the website. The major challenge for web designers is to identify key factors that help attract users to a website, maintain these users, and motivate them to purchase through the website.

Website evaluation research has been a productive area in Information Systems research. The questions of what should be evaluated and how to evaluate are central to this stream of work. Most IS research in this domain relies on web site users' subjective judgments about specific web sites. While there have been a number of web evaluation instruments proposed in the literature, most fail to meet the requirements for a theory based, carefully validated, general use measure. One that does is WebQual, [10].

WebQual is based on the Technology Acceptance Model [7] and the Theory of Reasoned Action [2, 8], and is focused on measuring those characteristics of a website that might contribute to a user's intention to revisit or purchase from a given web site.

WebQual is a well tested website quality instrument that expanded on the constructs from TAM to include 12 dimensions of website quality which can be further grouped into the familiar "usefulness" and "ease of use" of TAM, plus 3 other constructs important in this domain: entertainment, trust, and response time.

The structure and the definitions of the WebQual constructs are presented in Table 1. Figure 1 shows the empirical relationship of these constructs to intention to reuse/purchase, as presented by Loiacono et al. [10].

Table 1. WebQual constructs

Construct		Construct description
Usefulness	Information Fit-to-Task	The extent to which users believe that the Web site meets their needs.
	Tailored comms	Communications can be tailored to meet the user's needs.
	On-Line Complete-ness	Allowing all or most necessary transactions to be completed on-line
	Relative Advantage	Equivalent or better than other means of interacting with the company.
Trust	Trust	Secure communication and observance of information privacy.
Response time	Rapid Response	Time to get a response after a request or an interaction with a Web site.
Ease of use	Ease of Understanding	Easy to read and understand.
	Intuitive Operation	Easy to operate and navigate.
Entertainment	Visual Appeal	The aesthetics Web site.
	Innovativeness	The creativity and uniqueness of a Web site.
	Consistent image	The Web site does not create dissonance for the user by an image in compatible with that projected by the firm through other media.
	Emotional appeal	The emotional affect of using the Website and intensity of involvement.

2.2 Applying the dual-factor structure to intentions to use a website

Most technology acceptance studies that have focused on identifying the factors fostering adoption and usage have made the implicit assumption that the factors are bivalent, and linear across their range. Stated differently, factors which discourage adoption are merely the opposite of the enabling factors.

We see strong conceptual arguments why Web site characteristics might act as hygiene or motivator factors and have non-linear characteristics. For example, having at least a minimal amount of trust that a Web site is trustworthy (i.e. will not cheat the user or steal user information) would seem to be essential to intentions to reuse or purchase from a site. However, once there is some reasonable amount of trust, having higher levels of trust may not increase the likelihood of revisiting or purchasing from the site. Thus trust may act as a hygiene factor.

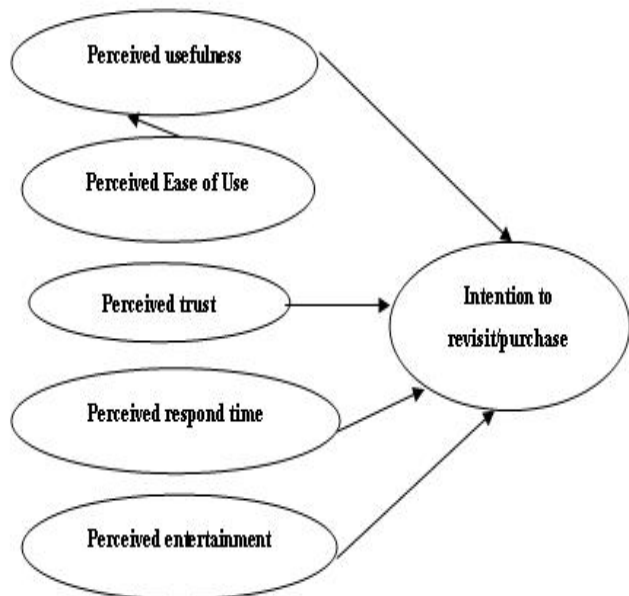


Figure 1. WebQual predicting web use

On the other hand, differences in the level of perceived usefulness may not matter very much at low levels of usefulness, but might matter a great deal at high levels of usefulness. Thus usefulness might act as a motivator factor. Zhang and von Dran [20] used the Dual-Factor theory to empirically differentiate website factors into the two types by identifying a collection of features or characteristics of Web sites, and then asking subjects to categorize those features as either hygiene or motivator factors in the context of a particular website [20].

Zhang & vonDran's [20] study does show that subjects could identify and distinguish hygiene and motivator factors, but it did not look at the shape of the curve for the relationship between perceptions of the web site and intentions to reuse.

Our paper takes that next step. We ask whether the WebQual constructs have differential roles (non-linearities) in predicting revisit or purchase.

3. Methodology and research results

We use empirical data gathered using the WebQual instrument [10] to investigate the possibility that website characteristics demonstrate hygiene or motivator characteristics. That is, they are not all bivalent factors with the same impact at high and low levels. Instead at least some of them have non-linear relationships with intention to revisit or purchase.

Data were collected in 2000 and 2002 from students at a large Southeastern University. Though the samples are similar to ones collected by Loiacono et al. [10], they are from different students, and use a different version of WebQual, in which the questions were grouped by construct on the questionnaire pages. The students were enrolled in or had just completed a course in MIS that included studying and accessing the web. Students who participated in the study received extra course credit, but they could also gain that credit by completing an alternate assignment.

Each student was given a context (e.g., “Imagine it is your friend’s birthday and you are searching for a good gift—a book.”). As in the Loiacono et al. [10] study, students were then asked to explore one of 12 designated websites (three each of four different types: Book, CD, hotel, and airline) for at least 10 minutes as if they were considering a purchase. They then completed a paper-based questionnaire containing the 36 WebQual items, as well as questions measuring intentions to revisit or purchase from the site.

We first did a careful assessment of the measurement validity of the data. Following that, we used two different approaches to test for hygiene and motivator factors -- quadratic regression and piecewise linear regression with connected segments.

3.1 Measurement validity

Measurement validity testing was conducted to ensure instrument validity and reliability. We first used a LISREL measurement model to test the fit of the data for the 36 questions to their 12 constructs. Table 2 shows the essential fit statistics for the Lisrel measurement analyses for the two datasets. Both data sets have good LISREL model fits.

In addition, all paths from constructs to their questions were highly significant with t statistics of greater than 8.0.

Second, a Cronbach's alpha test was run for each of the 12 factors in WebQual. In both datasets, Cronbach’s alpha reliabilities for all 12 constructs were greater than .70 as recommended by Robinson, Shaver, and Wrightsman [17] and Nunnally [13].

Finally, we performed an exploratory factor analysis of data for each dataset to test for discriminant validity. We used Promax rotation, since we expect that these constructs are correlated, though distinct. For the 2000 data set, we used an eigenvalue cutoff of .70 to produce 12 factors. All questions loaded cleanly on their constructs, with all but 4 loading in excess of 0.836. These 4 lowest loadings are .798, .738, .738, .676. All but two cross loadings are less than .30. This is a good fit to the data.

Table 2. Overall fit – 12 factor model

RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, NNFI = Non-Normed Fit Index.

	2000 dataset	2002 dataset	Target value
Chi-square / Degrees of Freedom	878.11 /587	1145.58 /701	Not applicable in large models, large sample sizes
RMSEA	0.041	0.048	< 0.06 to 0.08
CFI	0.986	0.986	> .900
NNFI	0.983	0.984	> .900

For the 2002 data set, the questions on “emotional appeal” were changed. The new questions did not perform well. We used an eigenvalue cutoff .69 to produce 12 factors. The loadings were high for 11 of the 12 constructs. However, two questions for “emotional appeal” had very low loadings (.234 and .134). Therefore, we dropped the “emotional appeal” construct for both datasets in the following analysis.

The average age of both men and women in the study was approximately 20. Most subjects had at least four years of experience with the web and the average number of online purchases in the last month was above one. (See Table 3).

3.2 Relationships between WebQual and intentions

All of our analyses below were based on relationships between the four higher order constructs of Webqual suggested by Loiacono et al. [10], and as shown in Figure 1. We calculated these higher order constructs from the twelve lower order constructs using the loadings suggested in Loiacono et al. [10]. Since Loiacono et al. suggested that the impact of

“Ease of use” was completely mediated by “Usefulness” as shown in Figure 1, to avoid multicollinearity we didn’t include “Ease of use” in the regressions predicting intentions.

Table 3. Subject demographic information

Dataset	2000	2002
No of obs.	290	276
Ave. age	21	20
Gender	M = 62 % F = 38 %	M = 51% F = 49%
Ever made a Web purchase	Yes = 67% No = 33%	Yes = 73% No = 27%
Average purchases in past 30 days	1.710	1.110
Average number of years using Web	4.660	6.210
Heard of the company before	Yes = 18% No = 82%	Yes = 21% No = 79%

Table 4. Linear regression analysis

Data set	Year 2000		Year 2002	
	Estimate	Pr > t	Estimate	Pr > t
Intercept	-1.260	0.013	-1.748	<.000
usefulness	0.159	<.000	0.198	<.000
Trust	0.198	0.0005	0.177	0.004
Resp	-0.023	0.693	-0.052	0.429
Entn	0.160	<.000	0.173	<.000
	N	Adj.R ²	N	Adj.R ²
	290	0.334	276	0.452

In order to provide a baseline, we first ran a linear regression on each data set to examine the straight-line relationships between constructs. The results are shown in Table 4. Note that usefulness, trust, and entertainment are significantly related to intentions in both time periods; response time is not significant in either.

To test for hygiene and motivator characteristics, we first used quadratic regression. More specifically, for each dataset we added, one by one in turn, a single squared construct term for the four predictors of intentions: usefulness, trust, response time and entertainment. This required 8 regression runs in total.

Table 5 shows, for each of the eight regressions, the added quadratic term, its main effect, and the resulting R². We note that in Table 5, multicollinearity between the main effect and the quadratic effect has blurred the impact of the main effect to the point that many main effects that were significant in the linear regression in Table 4, are now insignificant. This should not concern us, as the quadratic results for each of these clearly show that the quadratic terms should not be added.

Table 5. Quadratic regression analysis

Data set	Year 2000		Year 2002	
	Estimate	Adj.R ²	Estimate	Adj.R ²
usefulness	0.040	0.332	0.326*	0.452
uSquared	0.004		-0.004	
trust	0.643*	0.338	0.715**	0.460
trustSquared	-0.049		-0.060*	
resp	-0.210	0.332	-0.122	0.451
respSquared	0.020		0.007	
entn	0.257	0.332	0.327	0.452
entnSquared	-0.004		-0.007	

* = p<.05; ** = p<.01, *** = p<.001

Only one quadratic term is significant in these eight regression analyses -- "trust" in the 2002 data set. The graph depicting that relationship is shown in Figure 2. This shows the classic behavior of a motivating factor. At low values of trust, increasing trust has a big impact on intentions; at higher values of trust increasing trust has little impact on intentions. (A boxplot superimposed on the graph shows the dispersion of the values of trust -- about half the respondents gave responses between 4 and 6 on a seven point scale, as shown by the "box". A quarter of the respondents gave a response between 1 and 4, as shown by the leftmost "whisker".)

However, the fact that the quadratic term for trust was significant in 2002 but not in 2000 creates a difficulty in interpreting these results. Figure 3 shows the relationship between trust and intention in the 2000 dataset. The fact that the quadratic term for trust 2000 was not significant is embodied in the almost straight line in Figure 3.

Unfortunately, we had absolutely no prior expectation that trust would be bivalent in 2000 and a motivator in 2002. On the contrary, we expected that any hygiene or motivator effect would maintain its characteristics across the two years, whatever they were. When only one of two expected relationships is statistically significant, we have to be careful about our interpretation.

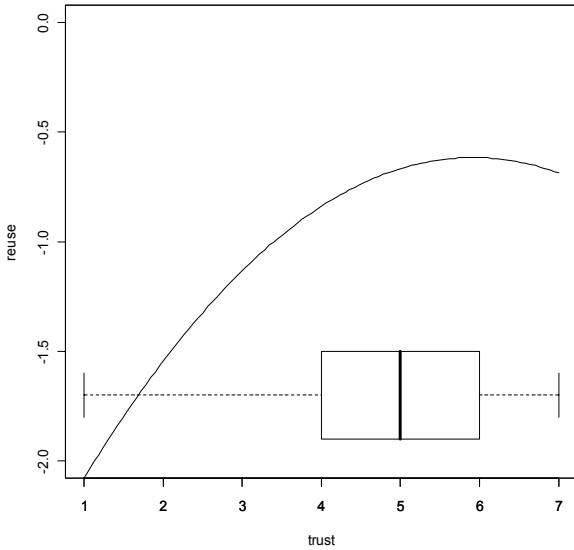


Figure 2. 2002 trust quadratic regression

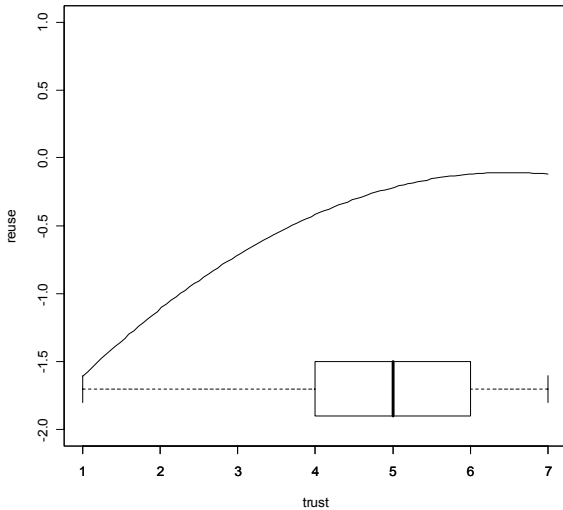


Figure 3. 2000 Trust quadratic regression

Even if we ignored the other 3 constructs (usefulness, response time, and entertainment), our statistical test for the significance of the trust quadratic terms in the two years should be adjusted by the Bonferoni method for a joint confidence interval, and would require we use .025 as the significance hurdle rather than .05. Under these circumstances, we would reject the hypothesis that trust demonstrated a motivator behavior, even in the dataset for 2002.

This might be the end of the story, except for a nagging suspicion that the true underlying relationship between any motivator (and in this specific case trust) might not be neatly captured by the quadratic curve, but might still clearly demonstrate motivator characteristics. We decided to investigate further.

Rather than a quadratic relationship, we decided to model the relationship between trust and intention as three connected straight lines, using a technique called piecewise linear regression. We divided the data in each dataset into thirds, based on the value of trust, and assigned dummy variables to indicate which segment a given data point belonged to.

More specifically:

$$\begin{aligned} \text{Dummy}_1 &= 1 \text{ if Trust} > T_{1/3} \\ &= 0 \text{ if Trust} \leq T_{1/3} \end{aligned}$$

$$\begin{aligned} \text{Dummy}_2 &= 1 \text{ if Trust} > T_{2/3} \\ &= 0 \text{ if Trust} \leq T_{2/3} \end{aligned}$$

By adding two interaction terms to the linear regression ($\text{Dummy}_1 * \text{Trust}$ and $\text{Dummy}_2 * \text{Trust}$ -- see Neter and Wasserman for more details) we were able to analyze the data as three connected line segments, and get statistical significance values for whether each shift in slope was statistically significant. The results are shown in Table 6 and Figures 4 and 5.

Table 6. Trust 3-pieces piecewise linear

Data set	Year 2000		Year 2002	
	Estimate	Pr > t	Estimate	Pr > t
Intercept	-2.077	0.002	-2.457	<.000
usefulness	0.158	<.000	0.193	<.000
trust	0.430	0.002	0.436	<.000
trustMedium	-0.307	0.212	-0.700	0.004
trustHigh	-0.134	0.693	0.578	0.156
resp	-0.025	0.675	-0.047	0.465
entn	0.167	<.000	0.167	<.000
	N	Adj.R ²	N	Adj.R ²
	290	0.339	276	0.467

Consider the 2000 dataset first. Although the Table 6 results for 2000 might be seen as consistent with the quadratic regression results for 2000 -- neither of the two shifts in slope in themselves are statistically significant -- Figure 4 shows a motivator pattern that seems quite pronounced.

It raises the question of whether we should be testing the incremental shifts in slope, or the total shift. Certainly the total shift seems substantial. We will return to this issue in a moment.

Now consider the 2002 dataset. Table 6 shows a statistically significant shift in slope from segment 1 to segment 2, but not from segment 2 to segment 3. In addition, the slope in segment 2 seems not to make literal sense -- why should intentions to revisit a site drop as trust in the site goes up in segment 2. Finally the shift in slope from segment 2 to 3 seems to be heading the wrong direction. However, interpreting segment 2 and segment 3 together, we see what looks like a leveling off of the impact of trust on intention from what we saw in segment 1. At present we must admit that this interpretation -- blurring and averaging segment 2 and segment 3 into a combined segment -- is really "in the eye of the beholder". We do not yet have any dependable statistical evidence for this interpretation.

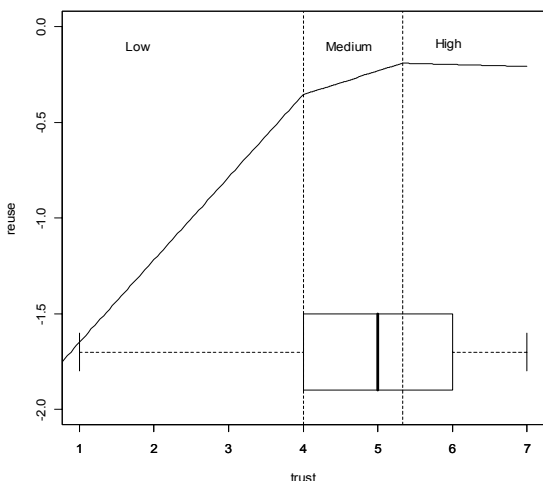


Figure 4. 2000 Trust Piecewise Linear

It is appropriate to contrast what we have argued is hygiene behavior for the trust construct in Table 6 and Figures 4 and 5, with a similar analysis for usefulness, which we presume (from the quadratic regression analysis in Table 5) is a bivalent factor. Table 7 and Figures 6 and 7 show the parallel analysis for usefulness.

There is certainly no suggestion of a hygiene or motivator effect in the results of this analysis. None of the slope shifts are statistically significant, and to the extent that there are small shifts, the subsequent shifts tend to move back in the other direction. The graphs in Figures 6 and 7 are not suggestive of anything other than a linear relationship.

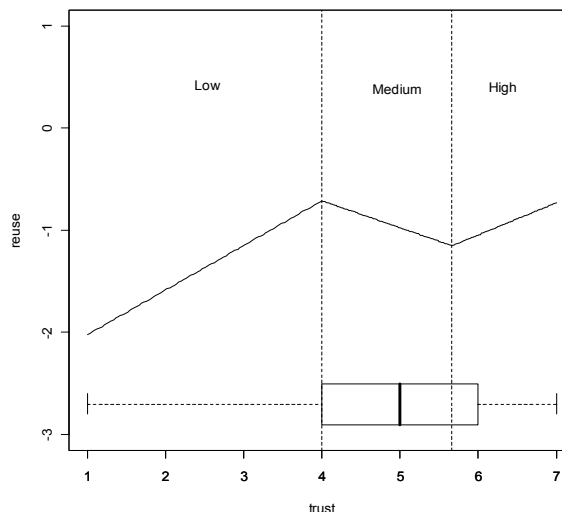


Figure 5. 2002 Trust Piecewise Linear

Table 7. Usefulness -- 3 pieces piecewise linear

Data set	Year 2000		Year 2002	
	Estimate	Pr > t	Estimate	Pr > t
Intercept	-0.991	0.219	-2.057	0.005
usefulness	0.137	0.010	0.217	<.000
uMedium	0.124	0.291	0.052	0.712
uHigh	-0.275	0.143	-0.198	0.281
trust	0.194	0.001	0.181	0.003
resp	-0.023	0.670	-0.055	0.404
entn	0.164	<.000	0.173	<.000
	N	Adj.R ²	N	Adj.R ²
	290	0.334	275	0.453

3.3 Reflecting on our results to this point

At this point it is appropriate to stand back, reconsider the phenomenon of hygiene factors, and ponder the best way to model those in a functional form. A quadratic model assumes a relatively smooth transition from low values (and high impact) to high values (and low impact). But what if the transition were more abrupt? What if the slope shift was fairly rapid, in a relatively small region? That certainly could be argued to be way that the hygiene affect would affect Trust. In this case what we would see might be more like only *two* straight lines, and a kink in between them.

This view is at least as true to the *idea* of a hygiene effect as the quadratic model is. Of course in modeling this there is the problem of figuring out where the kink occurs, but that is an operational difficulty, not a conceptual one.

It suggests that our three segment piecewise linear regression might be overkill. what we really need to model a hygiene affect is a two segment piecewise linear regression, but we do have the problem of deciding where the kink should be.

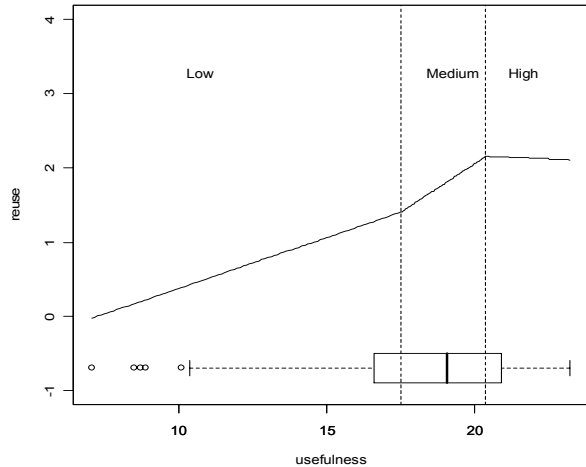


Figure 6. 2000 Usefulness 3 pieces piecewise linear

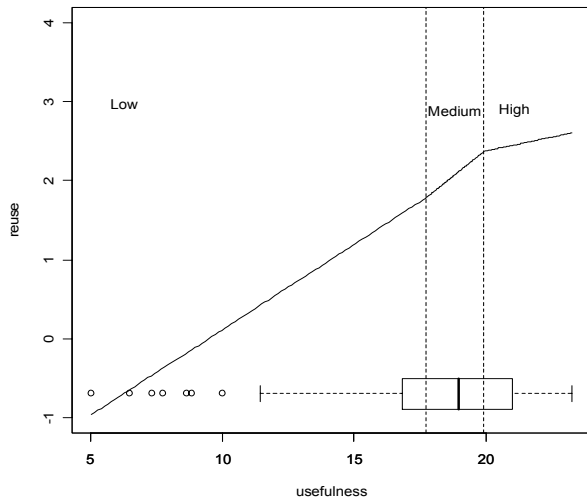


Figure 7. 2002 Usefulness 3 pieces piecewise linear

In the case of our WebQual data, our 3 segment piecewise regression suggests that the kink is probably in the vicinity of the one third point in the distribution of trust values. We redid our piecewise linear regression on Trust, with only two segments, kinked at the one third point. Table 8 and Figures 8 and 9 show the results of such an analysis.

Table 8. Trust -- 2 pieces piecewise linear, kink at 1/3 Point

Data set	Year 2000		Year 2002	
	Estimate	Pr > t	Estimate	Pr > t
Intercept	-2.121	0.001	-2.385	<.000
usefulness	0.159	<.000	0.197	<.000
trust	0.445	0.001	0.391	<.000
trustHigh	-0.373	0.041	-0.454	0.008
resp	-0.023	0.697	-0.054	0.408
entn	0.166	<.000	0.169	<.000
	N	Adj.R ²	N	Adj.R ²
	290	0.341	276	0.465

Now the shift in the slope from the first third of the data to the last two thirds is statistically significant in both datasets, as Table 8 shows. Although the second segment in the 2002 data is slightly downward sloping, it is not far from level. Together, Table 8 and Figures 8 and 9 present a fairly compelling picture of a hygiene effect for trust.

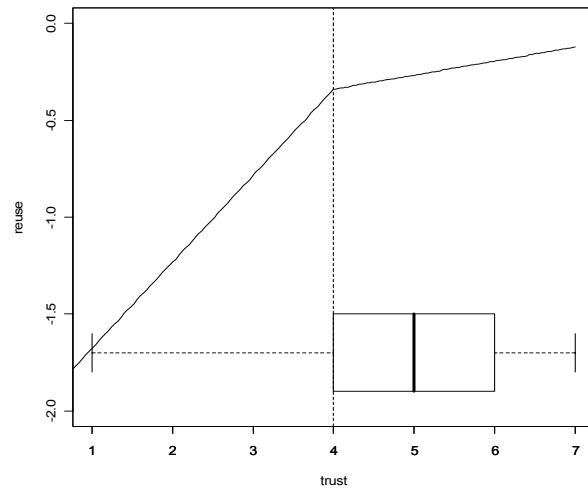


Figure 8. 2000 Trust -- 2 pieces piecewise linear, kink at 1/3 Point

4. Discussion and Conclusion

It is certainly true that we have done quite a bit of "exploration" before settling on our final model for the impact of trust on intentions to reuse a Web site. In that sense our results cannot be seen as confirmatory. However, as we have the same general results in two different datasets across two different time periods, our results are at least highly suggestive of a hygiene effect for trust. Future research will need to confirm this suggestion.

Even if confirmed, we need to be cautious about reading too much into our findings. Table 9 shows

the R^2 and adjusted R^2 for the various models we have tested. Although it is apparent that for trust, the three segment piecewise linear regression and the 1/3, 2/3 two segment piecewise linear regressions are "better" at explaining variance than the linear model, they are not *very much* better. Likewise they are "better" than the quadratic model, but not very much better.

A skeptic might argue that the explanatory power is so similar that the evidence to date offers no more than a coin toss' certainly of the value of taking a hygiene perspective. That may be so, but at least there is now also some doubt about the wisdom of taking a linear perspective.

Future research will have to further examine the shape of these curves, experiment with the best ways of finding the location of the "kinks", and determining the wisdom of treating the trust phenomenon as a hygiene effect.

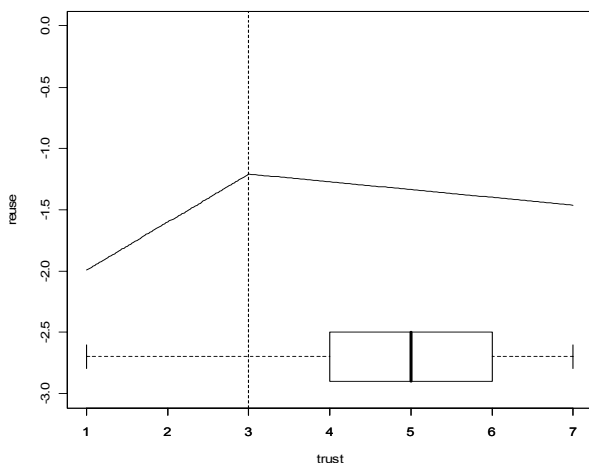


Figure 9. 2002 Trust -- 2 pieces piecewise linear, kink at 1/3 Point

In the mean time, we can speculate about what it might mean to practitioners if future research confirms that trust is essentially a hygiene factor in predicting Web site reuse. The implications are fairly straightforward and consequential.

If having a moderate amount of trust in a Web site is as good as having a great deal of trust in a Web site, developers of Web sites should not spend much money trying to move their customers' perceptions of trust beyond a middle level. That middle level is enough to get most of the benefit that can be gotten from increasing trust. On the other hand, increasing usefulness or entertainment value of a Web site will continue to have an impact on reuse, no matter how high the value is. So the question of whether trust has a hygiene effect could have a major impact on the way Web site designers allocate their resources

between ways to make sites more trustworthy and more useful or entertaining.

Table 9. R^2 s and Adjusted R^2 s

Model	Year 2000		Year 2002	
	R^2	Adj. R^2	R^2	Adj. R^2
Linear	0.343	0.334	0.460	0.452
Quadratic	0.349	0.338	0.470	0.460
2 piece (1/2, 1/2)	0.348	0.337	0.467	0.457
3 piece (1/3, 1/3, 1/3)	0.353	0.339	0.478	0.467
2 piece (1/3, 2/3)	0.353	0.341	0.474	0.465

4.1 Limitations

Although Dual-Factor theory has great intuitive appeal, it has drawn numerous conceptual and empirical criticisms. First of all, the dichotomies of motivations and hygiene factors are not mutually exclusive [14]. That means some factors identified as hygiene factors can cause satisfaction, and some factors identified as motivators can produce dissatisfaction. This overlap creates problems for the theory, and makes it difficult to validate. Our approach is that the way to identify a hygiene or motivator factor is by its empirical relationship to the target behavior or attitude. So in a sense we are side-stepping those classification problems.

Second, motivators and hygiene factors may be time dependent and contextual. Allport [5] maintains that motivation includes a dimension of time. What motivates people in the past may not motivate them in the present. Moreover, Pashler [15] holds that people pay attention only to stimuli that appeal to their current interests and needs, and that the strength of such stimuli weakens with time and familiarity. We don't dispute this, but suggest that at any point in time, certain factors do act as motivator or hygiene factors, and that this characteristic may well endure for a significant time.

Third, the propriety of using college students as subjects in social science research has been debated numerous times [6, 16]. However, researchers have found partial support for employing college students for theory driven studies [6]. Furthermore, because of their significant numbers online, college students should be an important group of interest in e-commerce research. These students will become the major players of the online consumer population. Therefore, college students should be considered appropriate subjects in our research. However, the student group is characterized as young, highly educated, and well paid as compared to the general

online population. Thus our study sample might be biased toward the young, higher educated online consumers. As a result, the findings of our study might not generalize beyond the current context.

4.2 Conclusion

For too long, technology acceptance research has emphasized simple and singular factors and mechanisms in explaining users' behavior. This study is among the first few to explore the non-linear mechanisms of Web site qualities. Within our study's validity boundaries, we can have presented highly suggestive evidence that, at least for Trust, traditional linear mechanism studies are ignoring an important aspect of the complexity of human motivations.

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