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Perceived Interactivity Leading to E-Loyalty: An Empirical Investigation of Web-Poll Design

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ABSTRACT

With the growth of e-commerce, novel applications of website interactivity are important to attract and retain online users. In this empirical study five levels of interactivity are examined using different web-poll applications. A model is created to validate the relationship of perceived interactivity to efficiency, effectiveness, enjoyment, and trust of the website. Further, specific elements of interactivity including control and user connectedness are examined for their relationship to trust. In turn, efficiency, effectiveness, enjoyment and trust are tested for their impact on e-loyalty. All relationships in the model are supported. In addition, qualitative comments from users regarding the various web-poll treatments were analyzed with subtle differences detected between treatments. The research advances knowledge on the consequences of perceived interactivity. It has additional merit in that the treatments employed and their outcomes will be of interest to web designers and online marketers for how to enhance interactive online web applications.

Keywords

Perceived interactivity, web-poll design, effectiveness, efficiency, enjoyment, trust, user control, user connectedness, e-loyalty, e-commerce.

INTRODUCTION

As e-commerce continues to grow, online vendors are continually seeking ways to best please their customers. Despite the potential for interactivity provided by the Internet, little attention has been paid to how interactivity might be more fully utilized (Johnson et al. 2006). In the current research, we create a model for testing based on the work of Teo et al. (2003) to test perceived interactivity to effectiveness and efficiency. To test our model, five treatments of interactivity for web-polls were created. Simple versions of web-polls are found on various vendor sites with indicators such as bar graphs or pie charts for how many people make a choice for a particular product or service. However, in more recent work in the field of information visualization, researchers are seeking to create more effective platforms for interactive communication between a user, the website, and possibly a community of users.

In sum, this investigation aims to offer the following:

- (1) Validation of a model in which perceived interactivity is expected to result in efficiency, effectiveness, enjoyment and trust for the user in a web-poll context.
- (2) Determination as to whether control and user connectedness result in trust for the user in a web-poll context.
- (3) Validation of whether efficiency, effectiveness, enjoyment and trust are positively related to loyalty. Since loyalty is a key consideration for online vendors, better establishing the link between perceived interactivity and loyalty is of both empirical and practical value.
- (4) Development of five graduated web-polls, including some novel examples, for testing. It is expected these versions of web-polls will be relevant to academic modeling, as well as to practitioner applications.

RESEARCH MODEL AND HYPOTHESES

To investigate perceived user interactivity in the specific context of a web-poll, a model for e-Loyalty is presented in Figure 1. The model builds on previous work on interactivity as well as adds new constructs. In this research, we define an interactive website as being: (1) interactive, (2) personal (3) having a variety of content, and (4) providing the user with immediate answer to questions. In particular, this definition is appropriate to a web-based polling environment when users are able to interact with the website to gain information about travel destinations.

Information Visualization is the use of computer-supported, interactive, visual representations of abstract data to amplify cognition (Card et al. 1999). Examples of web-based polling interfaces that employ information visualization formats are remarkably scarce. Most web-polling interfaces make use of graphics that are limited to bar and pie charts, and only for the *presentation* of data. For the interactive *capture* of data, the user is still required to click on the typical radio button or pull-down menu. Further, graphics such as star-ratings or mini pie charts in collaborative filtering pages like on Amazon.com, rarely display more than one variable. Research on advanced polling systems is scattered with limited guidelines for web-based polls. A contribution of

the current investigation is to create five levels of interactivity of web-poll design. While some of the treatments have historical precedent, others are innovations in the information visualization field.

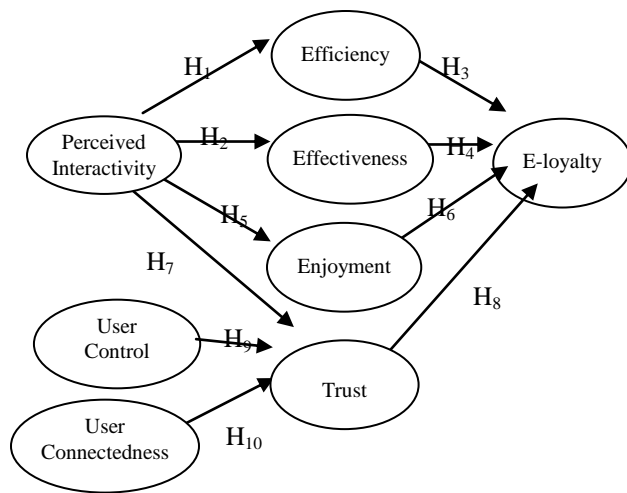


Figure 1. Proposed Research Model

Building on the work by Teo et al. (2003) although now in the specific context of five levels of a web-poll treatment, the following hypotheses are offered:

Hypothesis 1: Higher levels of Perceived interactivity will result in higher levels of Efficiency of the website.

Hypothesis 2: Higher levels of Perceived interactivity will result in higher levels of Effectiveness of the website.

Cyr et al. (2007) found significant relationships between perceived ease of use (PEOU) and perceived usefulness (PU) and between PU and E-loyalty. Considering the parallels between efficiency and effectiveness and PEOU and PU, we wish to test the relationships of effectiveness and efficiency to E-loyalty in the current web-poll context:

Hypothesis 3: Higher levels of Efficiency of the website will result in higher levels of E-loyalty.

Hypothesis 4: Higher levels of Effectiveness of the website will result in higher levels of E-loyalty.

Cyr et al. (2007) found enjoyment to statistically impact E-loyalty ($p < .01$) related to social presence of the website. To our knowledge no previous work has examined the relationship of perceived interactivity to enjoyment. In the current research, we expect that if users enjoy a website, they are more likely to have a positive attitude toward it and consequently will visit it again or have E-loyalty towards that site. In this study we will test the following:

Hypothesis 5: Higher levels of Perceived Interactivity of the website will result in higher levels of Enjoyment.

Hypothesis 6: Higher levels of Enjoyment of the website will result in higher levels of E-loyalty.

Consumer trust in the website has been found to be fundamental to building online loyalty (e-loyalty). In one study focused on perceived interactivity on customer trust in mobile commerce, Lee (2005) found the interactivity components in the model all significantly related to trust. Thus, the following is hypothesized:

Hypothesis 7: Higher levels of Perceived Interactivity of the website will result in higher levels of Trust.

Hypothesis 8: Higher levels of Trust in the website will result in higher levels of E-loyalty.

In a desktop (rather than a mobile application), it is expected that of the constructs tested by Lee (2005), control and connectedness may be relevant in a web-poll context. Control refers here to control of the information display format, as well as control of the content of the website that is viewed. User connectedness is the degree that a user shares experiences about a product of service with other customers at a website, and feels there is a “community” of users present. It would be expected that interactivity elements as present in a plot poll design of a website would result in control and connectedness for the user, that will then result in trust as found by Lee although in a mobile context. This leads to our final set of hypotheses.

Hypothesis 9: Higher levels of User Control of the website will result in higher levels of Trust.

Hypothesis 10: Higher levels of User Connectedness with the website will result in higher levels of Trust

RESEARCH METHODOLOGY

Participants for the study (341) were recruited from two major Canadian Universities. Virtually all participants (99%) considered themselves experienced in using the Internet, although responses differed as to actual online buying experience (from 1 to 10 years). Most respondents were undergraduates in their second or third year at university. They were recruited by email, and entered in a lottery draw for a \$200 Amazon.com gift certificate in exchange for their participation.

Task Design and Treatments

The experimental task consisted of browsing an e-Services website for booking vacation packages. The research design was a one-factorial experiment manipulating five levels of website information visualization with five independent groups. The presentation of a web-poll and ratings interface was the manipulated variable. Respondents were randomly assigned to the five groups, where each participant was exposed to only one level or condition.

Respondents were asked to imagine they had just returned from a vacation in Mexico, which they had booked from a fictitious travel planning site, called Travelier.ca. Travelier.ca was designed in terms of content and “look and feel” to resemble typical sites of this category, such as Travelocity.com. Interactivity levels differed across treatments in terms of the quality of human-computer interaction afforded to users. Illustrations of the five web-poll treatments are provided in the Appendix.

Instrument Validity and Reliability

A survey was administered after each participant completed the browsing task for the assigned website condition. All items in the survey were constructed as agree-disagree statements on a seven-point Likert scale. Additionally, two open-ended questions were posed at the end of the survey.

The survey items used in this research were adapted from previously validated work. Therefore, content validity for these two constructs was established through literature review (Straub 1989).

Using Principal Components Analysis (PCA), construct validity of our instrument was confirmed. After 3 items of the original 26-item survey were removed (due to high cross-loadings), all item loadings were greater than 0.5, with no cross-loading above 0.4 (as recommended by Hair et al. 1995). Similarly, discriminant validity was confirmed as the correlations between items in any two constructs were lower than the square root of the average variance shared by items within a construct (Fornell and Larcker 1981).

Additionally, construct reliability was established using Cronbach's α -value, which ranged from 0.800 for Efficiency to 0.948 for e-Loyalty. This is well past the thresholds recommended by Rivard and Huff (1988)

RESULTS

A variance-based Partial Least Square (PLS) structural equation modeling (SEM) approach was adopted in our data analysis, as it possesses many advantages over traditional methods (see Gefen et al., 2000, for details). The results of the PLS analysis are presented in Figure 2. All path coefficients of the causal links in our hypothesized model are significant. Approximately 61% of the variance in the E-loyalty towards websites was accounted for by the variables in the model ($R^2=0.615$). Additionally, the R^2 of all endogenous constructs in the model exceed the 10% benchmark recommended by Falk and Miller (1992).

Open-ended questions were coded via two independent coders using two methods: (i) in vivo (using the participant's exact words as the basis for a code), and (ii) open coding (using arbitrary labels to code the data). Categories were then developed to identify relationships between codes, followed by the creation of more theoretical entities called concepts. Five main concepts emerged from our data:

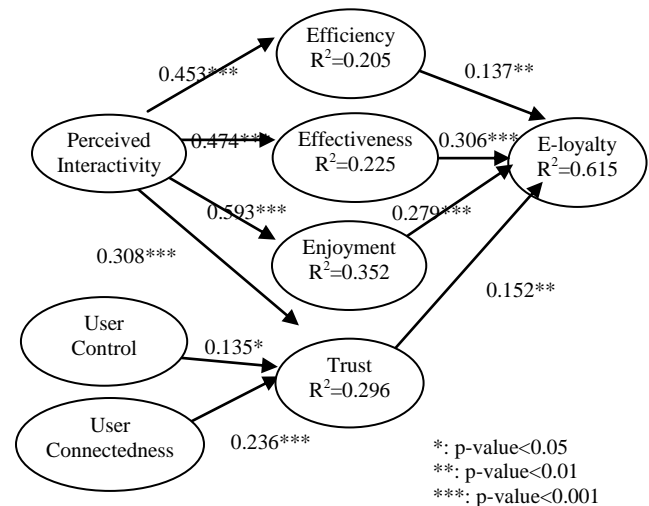


Figure 2. PLS Structural Model (n=341)

Aesthetics: Visual design qualities that lend a sense of attractiveness or pleasant appearance to the website. This concept is encapsulated by codes like ‘cute’, ‘bright’, and ‘unique design’.

Affective property: Refers to design elements with emotion inciting qualities. The codes ‘exciting’, ‘fun’, and ‘personal warmth’ are examples of affective properties.

Functional property: Elements of website structure including information design/content, navigation, and layout. Examples of codes include ‘organized’, ‘informative’, and ‘lacking detail’.

Interactivity: Elements of the website that give users various opportunities to interact with the site and other users. Examples of codes include ‘limited feedback’, ‘opportunity to view other’s opinions’, and ‘immediate response to rating input’.

Trustworthiness: Refers to the degree users trust the website and its content in making their decisions. This concept is encapsulated by codes like ‘credible’, ‘faked’, and ‘biased’.

From a quantitative point of view, there were no statistically significant differences between web-poll treatments in terms of perceived interactivity. However, qualitative analysis of open-ended questions revealed some interesting insights. The only positive comments for the control treatment (T1) centered on concepts of aesthetics and functionality. While this treatment provided some customer reviews, it did not allow users to provide input via a web-poll or other mechanism. Comments related to trustworthiness and interactivity only appeared in the negative for this treatment. For the other treatments, which provided different types of web-polls, positive comments emerged for both trustworthiness and interactivity.

When users were offered opportunities to provide input via a web-poll many of their comments centered on their desire to provide additional forms of input to increase credibility. This was particularly evident in the treatments that provided the most complex web-polls (T3: 3x3 web-poll matrix; T4: pre- and post-event continuous scale web-polls). These participants commented that the web-poll ratings would likely influence their decisions, but strongly encouraged further user input through discussion groups and blogs. It appears that stimulating interaction through advanced web-polls also stimulates the desire for further interaction via other 'more credible' methods.

DISCUSSION AND CONCLUSIONS

Perceived interactivity in website design has received limited research attention. In this study the outcomes of perceived interactivity were investigated, with subsequent impacts on e-loyalty. The model developed and tested is supported for all hypothesized relationships. In addition to survey data, qualitative comments from participants provide further insights into how interactivity impacts the user. Taken collectively, the study provides new insights into the merits of website interactivity. The treatments employed offer novel applications into information visualization, and as such are useful to both researchers as well as to practitioners.

As set out in the introduction of this paper, this research achieves the following goals:

- (1) Perceived interactivity is found to positively impact user perceptions of efficiency, effectiveness, enjoyment and trust in a web-poll context.
- (2) Control and user connectedness result in trust for the user in a web-poll context.
- (3) Efficiency, effectiveness, enjoyment and trust are positively related to loyalty.
- (4) Five levels of web-poll design are tested which afford new perspectives on how information can be visualized for the user, and subsequently differences in user reactions to the various conditions.

Overall, our findings represent an extension to previous work on design characteristics and e-loyalty to now include interactivity leading to efficiency and effectiveness as a precursor to positive and repeat customer relations. Further, interactivity results in enjoyment and ultimately e-loyalty. As such, interactivity has a hedonic component, supporting work by Childers et al. (2001) and van der Heijden (2003) now tested with different web-poll treatments. This is further supported in the constructs for Aesthetics and Affective properties emerging from the qualitative data. The visual appeal of the web-poll design seemed to be important not only to elicit positive impressions of the website, but also emotive commentary such as the website was "exciting". To our knowledge, this is the first time perceived interactivity has been linked to enjoyment in website design.

Although there has been considerable work on trust in e-commerce (for example, Gefen et al. 2003), it has not

focused on interactivity components. In this study the relationship of perceived interactivity to trust is supported in a desktop online environment using various web-poll applications. In addition, in alignment with Lee (2005) specific elements of interactivity such as control and connectedness resulted in trust. Qualitative comments supported that interactivity seemed central to providing the user with a sense of trust. Having rating features on the website was mentioned to make the website more trustworthy, with the ability to affect a user's decision about a product or service. On the negative side, several users mentioned the ratings may be unreliable or "faked". As such, the vendor or website designer may want to assure users of the credibility of the information offered.

The findings suggest that perceived interactivity has positive effects on the user that ultimately results in e-loyal behavior. Hence, if online web designers and marketers wish to attract and retain customers then enhancement of web features that allow user interactivity is desirable. Treatments 3, 4, and 5 as developed specifically for this study present innovations in web-polling. As such they offer prototypes to designers for how to create new forms of information visualization with interactive components. The applications used in this study offer presentations of data, as well as the ability of the user, to capture data based on assessments by other users. The value of this work goes beyond e-commerce to include applications for other groups such as online communities. For instance, the work by Ivanov et al. (2006) involved web-polling on a site for sharing medical information. As with Ivanov et al. it is quite likely that use of multivariate visualizations as in this study can potentially serve to engage otherwise low frequency contributors.

Qualitative analysis of open-ended comments also reveals interesting implications for web designers. While perceived interactivity has positive consequences, designers should employ appropriate combinations of interactivity mechanisms to increase credibility. Web-polls, and advanced web-polls in particular, stimulate the desire for interaction and input. Once this desire is activated, users may feel unfulfilled if they are not given an opportunity to interact at different levels. Coupling web-polls with discussion forums and blogs can help to build credibility and fulfillment with the interaction experience.

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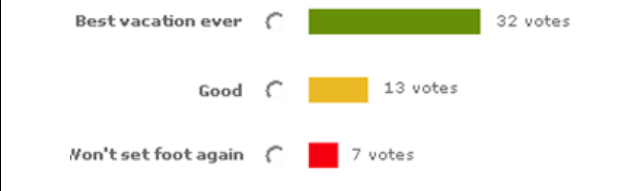
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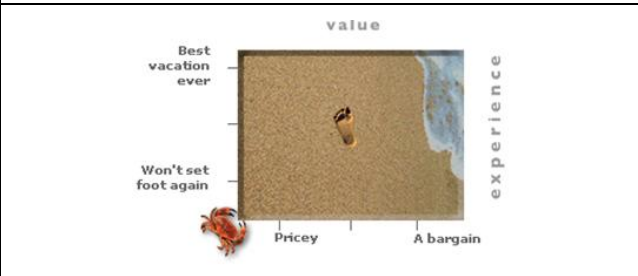
APPENDIX: EXPERIMENTAL TREATMENTS



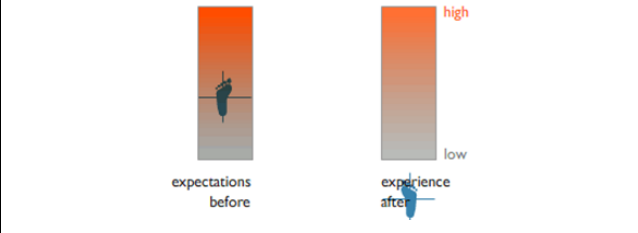
T1: Control version. No user interaction with web-poll; static indicator of other users' rating only




T2: Basic web-poll with conventional interaction (radio button) and simple information visualization (bar chart).



T3: Metaphor-rich web-poll. Cursor reveals foot icon across sandbox to select one of nine possible value combinations on a grid. Mini plot on front page with size of dot displaying number of votes.



T4: Flash version for enhanced user control. Cursor changes into foot icon, moving on scale continuously. Front page summary uses color lightness to represent weight. Bar levels give a positive/negative ‘slope’ for before and after



T5: Enhanced Bar Chart version for visualizing user contribution. Users ‘viscerally’ plot their vote to the stack by adding a ‘brick’.