RESEARCH ARTICLE

Conversation as a source of satisfaction and continuance in a question-and-answer site

Raban Daphne Ruth

University of Haifa, Haifa, Israel

Correspondence: Raban Daphne Ruth, Graduate School of Management, 610 Jacobs Building, University of Haifa, Mount Carmel, Haifa 31905, Israel.
Tel.: +972-4-8288492
Fax: +972-4-8249194
E-mail: draban@univ.haifa.ac.il

Abstract
Generating sustainable business value from information services is challenging on the web where free information and zero-switching costs are the norm. This study examines the role of free comments given in a commercial information service through the lens of the expectation-confirmation theory and continuance. Data from a question and answer web site are analyzed by structural equations modeling to test the theoretical model whereby customer satisfaction is key to continuance and is predicted largely by social interaction that takes place on the site. The model is supported by the field data retrieved from the site. The data show that people came with equal expectations, received equal service, and continued to use the system if they were satisfied with it. Satisfaction was predicted by conversation. Free activity emerges as an integral part of the service in a fee-based information market, improving satisfaction and continuance, and thereby leading to measurable outcomes for the commercial owners of the site. The findings, based on unobtrusive field data rather than self-report questionnaires, extend expectation confirmation theory by adding a social dimension to it.
European Journal of Information Systems advance online publication, 25 October 2011; doi:10.1057/ejis.2011.42

Keywords: information markets; incentives for participation; expectation-confirmation theory; satisfaction; continuance

Introduction
The World Wide Web hosts a multitude of sites that invite active user participation such as wikis, blogs, video sharing, or social networks. The web is also a fertile source of data for research, as user contributions are explicit and are often available for harvesting and analysis. Analyzing the data retrieved from information sharing sites holds promise for gaining a deeper understanding of user behavior using unobtrusive research methods. The challenge in this kind of research is to try and find an appropriate theoretical model to explain field data patterns. Indeed, studies based on such data have been published over the past few years; however, many of them are descriptive rather than inferential (Raban & Rabin, 2009). This paper takes field data and examines it through a theoretical lens, trying to explain information consumption behavior.

One type of participatory web site that has received some research attention over the past few years is the question-and-answer (Q&A) sites. Various motivations have driven research on Q&A sites, including the assessment of labor economics (Edelman, 2004; Regner, 2005) or of the relation between payment and value (Hsieh *et al*, 2010), a comparison of answer quality in different Q&A sites (Harper *et al*, 2008), investigating motivations to provide answers (Raban, 2008b; Raban, 2009), and

characterizing knowledge sharing patterns (Adamic *et al*, 2008). These studies focus on the supplier side of Q&A sites, the answer providers. However, to ensure sustainability, such sites need a constant or increasing flow of incoming questions. People who ask questions are the site customers, yet, we do not know whether consuming information is similar to known consumption patterns. Studying the motivations of such information consumers will shed light on the inclination to participate in online information environments and will advance our knowledge on the consumption of information.

Customer retention in internet-based businesses is especially challenging because usually alternative service or product providers abound and switching costs are minimal. This is particularly true for information services, which tend to be commoditized with a price of zero. Nevertheless, paid information coexists on the web with free information leading to the questions: How can free and paid information coexist? Does free information have a special role in a fee-based information service? The claim in this paper is that free information plays a part in the formation of satisfaction by the service consumers leading to customer retention. Therefore, this study focuses on the antecedents for customer satisfaction in a fee-based online Q&A service and implies that the availability of free information by conversation catalyzes further fee-based market activity.

Users' explicit satisfaction from the answers they received is presented in a model supported by unobtrusive field data showing that consumers are socially motivated even when payment is involved. Social interaction emerges as an important driver of actual satisfaction and continued use of the Q&A site. The paper extends the theory on information consumer satisfaction by adding a social dimension to the current knowledge, and examines actual satisfaction in real information transactions by using behavior log data collection and analysis. The paper starts with an explanation of the theoretical underpinnings of the present research in order to create the link between social interaction, satisfaction, and continuance. Next the Q&A web site researched is described, followed by the methodology, results, and their implications.

Satisfaction theory
This section explains the importance of customer retention and satisfaction, and presents continuance as a measure of system success. Satisfaction, which is a significant predictor of continuance, is then explained in light of the literature and the special circumstances created online. The events and indications occurring before the expression of satisfaction from the information exchange are taken as antecedents for satisfaction in the proposed model.

Customer retention and satisfaction
Beyond finding new customers, retaining old ones is critical for sustainability, is an important long-term strategy, is important for word-of-mouth marketing, and is much less expensive than soliciting potential new customers (Bhattacherjee, 2001a; Qureshi *et al*, 2009). One of the central tenets of customer retention is satisfaction. Satisfied customers tend to be loyal and continue using the same service or product. Satisfaction is a measure of how well early expectations were met and it is known to be an important predictor of the intention to continue consuming products and services (Anderson, 1973; Bhattacherjee, 2001a). However, satisfaction on the World Wide Web is not necessarily identical to known principles in the offline marketing world because the nature of interaction and communication in digital markets is different than that in physical markets.

Customer retention in web-based business, and particularly in information markets, is challenging because the competition is open, explicit, and information-rich. Prior research addressed the link between satisfaction and consumer intentions to keep on using products and services (Anderson, 1973; Taylor & Todd, 1995). Further research distinguished between intention to purchase and actual purchasing behavior (Mittal & Kamakura, 2001).

The literature on information systems (IS) use has dealt with questions about the link between satisfaction and customer retention, also referred to as *continuance*. In the IS context, the link between satisfaction and continuance was confirmed and extended by showing a link between continuance and perceived usefulness (Davis *et al*, 1989; Bhattacherjee, 2001a). Another study, which focused on an e-learning service, proposed that users' continuance intention was determined by satisfaction, which in turn was jointly determined by perceived usability, perceived quality, perceived value, and usability disconfirmation (Chiu *et al*, 2005). In other words, satisfaction is operationalized in the research literature by an algebraic difference between expectations measures and perceived performance measures or by subjective scales. Thanks to the explicit nature of online interactions, satisfaction in the present work is operationalized by creating a latent variable from three consumer feedback inputs provided by use of the Q&A system. In summary, the connection between satisfaction and continuance is well established in consumer research and in IS research and is reflected in the first hypothesis. The study starts by hypothesizing on a known relationship in order to form a basis for interpreting the unknown relationships explored.

H1: *Satisfaction positively affects Continuance.*

The IS literature has not examined the direct effect of conversation on the consumers' satisfaction and continuance. There are many notable studies that use field data to explore feedback mechanisms, for example, in eBay. These studies analyze formal and informal feedback mechanisms built into eBay's system to research the effect on trust and pricing but not on continuance *per se*

(Resnick *et al*, 2000; Resnick *et al*, 2006). The present study wishes to narrow this gap.

Satisfaction in information markets

According to the well-known theory of expectation confirmation (ECT), which is also called expectation disconfirmation theory (EDT), satisfaction depends on meeting the pre-usage expectations of the consumer (Oliver, 1980). The expectations are compared with the post-usage perceived performance, leading to a cognitive assessment that results in the affective state of satisfaction. When expectations are met, satisfaction is higher than when expectations are disconfirmed. The assumption of ECT/EDT seems to be that satisfaction is derived from product or service performance. The same holds in the IS literature where satisfaction is based on ease of use, usefulness, service quality, and information quality (Ong *et al*, 2009). However, information is not a regular consumer good or service; it is an intellectual product that requires mental processing and personal involvement in assessment of its benefit to the user (Raban, 2007), which is likely to translate into satisfaction.

Information is an experience good (Shapiro & Varian, 1999; Van Alstyne, 1999). Before using information, the user may know about some technical features such as the length of the text, when it was created, name of author and so on. A user may use these attributes and other heuristics to form expectations before actual consumption. Then, the actual use of information is a subjective experience that leads to the formation of impressions translated into a degree of satisfaction that, in turn, is one of the central constructs of IS' success (Delone & McLean, 2003). Satisfaction is a person's attitude toward a variety of factors of a situation affecting the person's subsequent re-purchase intention and behavior. The literature on IS user satisfaction follows the tradition of ECT/EDT and mostly describes object-based beliefs and attitudes (Wixom & Todd, 2005) such as content relevance, accuracy, and timeliness.

The present work suggests that because of the special nature of information as an intellectual product and experience good, satisfaction grows also by social interactions, free form conversation, in an IS. Conversation may lead to an expansion of knowledge and it may provide social gratification. In both cases, satisfaction from the resulting information product, the answer received in the Q&A site, will grow. The next section explains this in more detail.

Social antecedents of satisfaction and continuance There is a time interval between the formation of expectations and the evaluation leading to the degree of satisfaction experienced. During this time, the product or service is used and other things may occur that may influence satisfaction. For example, in the area of information transactions, conversation may occur and influence the level of satisfaction. Earlier research has shown the importance of the user experience and specifically of social presence and conversation in e-commerce web sites explaining the importance of social activity to business (Kumar & Benbasat, 2002; Jiang *et al*, 2005). Virtual presence in online English and Dutch auctions was shown to encourage more efficient markets (Rafaeli & Noy, 2005). Research in Q&A sites exposed the finding that individual information producers are motivated to some degree by conversation even in the presence of monetary incentives (Raban, 2008a). Conversation was found to promote persistence in providing information. In addition, it has been established that users contribute more online when they feel a social environment rather than contributing to a database (Connolly & Thorn, 1990).

Taking together the earlier studies about presence in e-commerce and the effect of conversation on information producers, it stands to reason that their market counterparts, the information consumers who are their conversational partners, may also factor social interaction into their overall feeling of satisfaction, and tend to continue using the information service. Therefore, in the current study, conversation that occurs before receiving a paid answer is taken as an antecedent of the users' expressed satisfaction with the answer. Further support for conversation as an explaining variable is based on the assumption that conversation may contain parts of the desired information, thus enhancing the paid answer. This raises the question as to whether conversation is a predictor of satisfaction that leads to continuance or whether conversation is a direct predictor of continuance. Figure 1 shows the two possible cases that will be tested and are formalized in hypotheses H2 and H3.

H2: *Conversation positively affects Satisfaction.*

H3: *Conversation positively affects Continuance.*

Pricing and timing as antecedents of satisfaction Other factors precede and therefore may predict satisfaction: the price bid provided by an asker for the question submitted, and the length of time it takes for receiving an answer. Stated price bids for answers are taken as the representation of expectations. Price gives the answer provider a cue as to the level of effort expected by the asker in order to deliver a sufficient answer. As price expresses expectation, it is one of the predictors of satisfaction in the model presented in Figure 1 leading to hypothesis H4.

H4: *Price positively affects Satisfaction.*

In the current research, conversation is proposed as a new predictor of satisfaction. As in the Q&A system a price bid precedes conversation, we must take into account that the relationship between price and satisfaction may be mediated by conversation as stated in the fifth hypothesis:

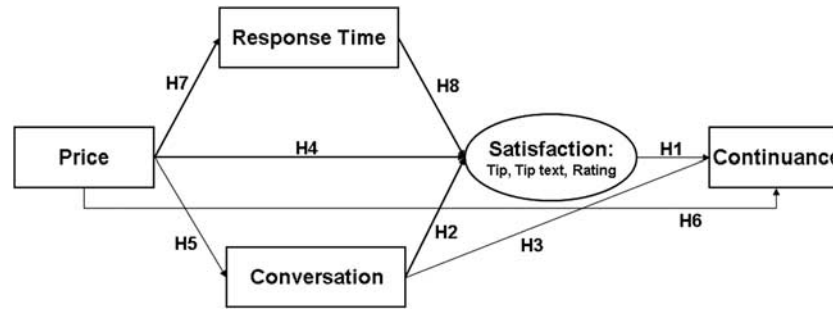**H5:** *Price positively affects Conversation.*

Figure 1 The proposed model to describe satisfaction, its antecedents, and consequence.

It is possible that in a paid system customers may return for more business simply because they feel they are getting cost-effective service. For this reason Figure 1 shows a possible direct connection between price and continuance, a connection that will be tested and is described in H6.

H6: *Price positively affects Continuance.*

Another type of expectation known in the literature regards the waiting time to receive a service. Time is often inversely related to satisfaction with services; however, this relationship is not obvious in regard to information service, again because of its nature as an intellectual product. In this case, duration may signal more effort in searching and compiling the answer. If price bids provide a cue to answer providers as to the level of effort expected, then a positive correlation is expected between price and time spent in search of an answer: longer time may indicate a better thought-out answer leading to higher satisfaction. Yet, theory (Carmon *et al*, 1995) tells us that time is inversely related to satisfaction: people who wait less for service are more satisfied than those who wait longer. The hypotheses appearing in Figure 1 (H7 and H8) account for this tension between theories, although in the special case of information provision, there may emerge a positive correlation between time and satisfaction.

H7: *Price positively affects Response Time.*

H8: *Response Time negatively affects Satisfaction.*

Antecedents of satisfaction and continuance in a Q&A site

In the present study, the interaction is between an individual information consumer and the potential service providers, as well as other visitors of the web site. The interaction occurs within a larger system that mediates the entire Q&A service, and is believed to be an antecedent of satisfaction together with timing and pricing. The present approach is to look at the actual expressions of satisfaction following real information transactions. The explicit feedback that consumers provide after they receive the paid answers is taken as a measure of satisfaction. Three forms of feedback are available in our data set: ratings of answers received, gratuity payment, and brief textual feedback. They are further explained in the 'Method' section.

In order to study the tendency to continue using the Q&A service, we operationalize continuance as the difference in the first encounter with the system between one-time users and returning users. The first encounter between a user and an IS is crucial as it is likely to influence the decision to continue using the same system. This continuance decision is based on perceived usefulness, but mainly on satisfaction (Bhattacherjee, 2001a, 2001b). Satisfaction was found to be a critical factor for establishing long-term client relationships (Patterson *et al*, 1997). The present research used unobtrusive data, therefore, the Q&A site users were not asked about their perceptions about usefulness or about their personal attitudes and preferences. Instead, the study explored three possible antecedents to satisfaction: payment, time to answer, and conversation before the paid answer. As explained earlier, direct links between payment, conversation, and continuance are also tested in order to verify that satisfaction is key to the success of the information market.

Background summary

The present research studies the factors leading to satisfaction and continuance in an online fee-based Q&A site (Google Answers (GA)), which also offers free conversation. In GA we observe and measure actual behavior by real information consumers, who go through a full cycle of providing a price bid for the information needed, engaging in conversation, obtaining the paid answer, and expressing their satisfaction by three specific mechanisms. The price bids represent the askers' expectations about the effort needed to provide a sufficient answer. The answer providers see this signal and respond by a corresponding level of effort represented in this study by the amount of time needed to provide the answer. In the mean time free comments are exchanged. Finally, the askers employ three feedback mechanisms (gratuity payments, ratings, and textual comments) to express their satisfaction. Subsequently, information

consumers will decide whether to use the service again or not. Figure 1 captures the proposed relationships together with the corresponding hypotheses.

Researching among search data

This study is based on analyzing field data from actual transactions that took place in the GA Q&A web site during the course of 4 years of the site's activity. Although the service was discontinued by Google as of 1 December 2006, all the data are freely available via the World Wide Web (http://answers.google.com). Earlier studies on satisfaction have been limited to self-report questionnaires. Instead, we report field data from real transactions.

The next sections will describe GA's mode of service, the variables extracted from it for the current study, the sample, and the method of analysis.

Google Answers

GA was an online Q&A IS established in April 2002 and described by Google as *a way to get help from Researchers with expertise in online searching* (http://answers.google.com). GA was a hybrid, economic and social, information exchange, which offered answers to questions by pre-selected search experts. It worked well with a steady increase in activity for more than 4 years. The service was shut down by Google at the end of 2006 with no official explanation. Maybe Google simply lost interest in this small-scale project in order to promote other projects, which were at a higher priority for the company. Another reason for the shut-down may have been the opening of Yahoo Answers, a free Q&A site. Regardless of the reason for discontinuing the service, Google left all the data online in the public domain and it serves as an interesting source for field data, thanks to the unique combination of free social exchange of information and fee-based service. Given this unusual business model, it is intriguing to learn what makes online question askers re-use the site. This question is particularly interesting in light of the popularity of the discussion about free information (Anderson, 2009). If free is so great, and search engines have always been free, why do people use paid, human, search services?

GA was selected for this research because it was a unique hybrid, social and economic, information exchange service that enables one to see the way askers interact with the researchers, to track their tendency to be one-time or continuing users, and to examine their actual satisfaction and its antecedents.

The procedure for using the site was as follows. First, an asker would submit a question together with a price bid expressing his/her willingness-to-pay for the answer (Price). One of over 500 GA researchers (GARs) would lock the question and search for information to form the answer. During the time it took the GAR to produce the paid answer (Response Time), any system user could submit comments, which were free-form conversation, not part of the economic transaction. Once the answer

was submitted, payment was transferred (Google collected 25%) and the asker could provide feedback to the GAR. Feedback mechanisms included ratings on a scale of 1–5 stars, gratuity payment called 'tip' on the system, and text, which accompanied the tip. The provision of all kinds of feedback was voluntary.

Variables

The variables harvested from the system include the following:

Price: the dollar value of the asker's bid. Price is seen as an estimate of the effort needed to provide the answer and as an estimate of the value of the answer to the asker. It expresses the asker's expectation from the answerer in terms of time invested and quality of answer. The price bid for answers was not normally distributed. We observed that people evidently preferred to use round figures such as U.S.\$10, 15, and 20. In order to use this variable we recorded it as an ordinal variable with nine levels: U.S.\$2–4.99, U.S.\$5–9.99, U.S.\$10–14.99, U.S.\$15–19.99, U.S.\$20–24.99, U.S.\$25–29.99, U.S.\$30–49.99, U.S.\$50–99.99, U.S. \$100 $=<$.

GARs' Response Time: the length of time needed for the GAR to perform online searches and formulate an answer for submission on the site. Owing to the abnormal shape of the distribution of this variable we transformed it into an ordinal variable with eight levels: <1 day, 1 day $=<RT<2$ days, 2 day $=<RT<3$ days, 3 day $=<RT<4$ days, 4 day $=<RT<5$ days, 5 day $=<RT<6$ days, 6 day $=<RT<7$ days, 7 days $=<$.

Comments: free-form conversation directed at the asker. Any GA active participant or visitor and any GAR could post comments. For the present study, only comments sent before the answer was submitted were counted, as we wanted to observe if there is a relationship between comments and answer feedback. We observed the variable in its natural shape, except for the questions that got more than 10 comments, which we recorded as one group (0.4% of the sample). This variable is a quantitative measure of conversation intensity as represented by the number of comments.

Rating: a social feedback mechanism using a scale of 1–5 stars to indicate the asker's satisfaction with the answer received. Most the answers were rated 4 or 5 stars (91.3%). We recorded the variable into a dichotomous scale of rated (44.9%) or not rated (55.1%).

Tip (gratuity payment): a socially motivated monetary reward expressing gratitude and indicating that the answer has exceeded earlier expectations, which were earlier expressed by the price. Based on the tip distribution, the tip was recoded into five ordinals groups: U.S.\$0, U.S.\$1–4.99, U.S.\$5–9.99, U.S.\$10–99.99, and U.S.\$100. The latter value was the limit set by Google.

Figure 2 Screenshot example of feedback mechanisms on GA.

Tip Text: another social feedback mechanism providing a comment to accompany the monetary tip. This variable is a quantitative measure of feedback intensity as represented by the number of tip-related comments such as 'thank you' or as seen in Figure 2. Tip text can be used only by askers, who decided to provide a monetary tip; therefore, it stands to reason that tip text mostly indicates positive feedback.

Figure 2 contains a screenshot from GA that illustrates the feedback mechanisms as they were displayed on the web site (this example is from GA question number 238877).

Satisfaction: a latent variable composed of the three feedback indicators: Tip, Tip Text, and Ratings.

Continuance: the dependent variable determined by the dichotomy: continue or discontinue using the GA service (i.e., ask one question or more than one).

To summarize the variables, there are three pre-answer variables: Price, Response Time, and Comments; three post-answer variables, which are combined into Satisfaction; and the dependent variable, Continuance.

Data
In order to examine the research hypotheses, all of the *first time* askers that received an answer for their questions were entered to the study ($N = 27,368$). Of those askers, 72.2% were a one-time user only of the GA service, meaning that they have asked only one question and did not continue using the site ($N = 19,770$). The other 27.8% of the population asked more than one question at the GA site ($N = 7,598$) – those are the continuing users. The number of questions they submitted ranged from 2 to 513 questions per asker.

The following analysis pertains only to the first Q&A set for each asker in both groups.

Results: the importance of ratings and tip text

Descriptive statistics
This section presents a comparison between two groups of participants: one-time users *vs* continuing users regarding the antecedents and feedback mechanisms relating to the first question submitted to the GA site.

Price: By definition, the GA system allowed askers to bid a price of U.S.$2–200 per question/answer. On average the one-time askers bid U.S.$21.27 per question (SD = 34.55) and the continuing askers bid U.S.$23.22 (SD = 35.95). As the sample included all the first time askers population the effect size was checked by Cohen's *d* (Cohen, 1992). There is no statistically significant difference between the groups with regard to the price that they bid for the first question (Cohen's $d = 0.05$).

Response Time: On average, one-time askers got an answer in 25.63 h (SD = 61.76) and the continuing askers got an answer in 24.29 h (SD = 58.26). There was no statistically significant difference in response time between the two groups (Cohen's $d = 0.02$).

Comments: The range of comments per question (before receiving an answer) was between 0 and 60 comments. A large part of the questions (55.8%) got at least one comment. The comments were largely on an ordinal scale. A χ^2 test indicates that there is a dependence between the number of comments per question and the tendency of the asker to be a one-time asker or a continuing asker ($\chi^2 = 61.49$, DF = 10, $P < 0.001$). While more than half of the one-time askers did not receive any comments (55.2%), 51.7% of the continuing askers received no comments. Moreover, continuing askers tended to get more comments than one-time askers at any other level of the additional nine levels of comments. The first question of the continuing askers invariably received more comments than the first question of the one-time askers.

Rating: 55.1% of the askers rated the answers that they got using a range from 1 to 5 stars. A χ^2 test indicates that there is a dependence between rating the answers and the tendency of the asker to be a one-time asker or a continuing asker ($\chi^2 = 1172.35$, DF = 1, $P < 0.001$). While 82.5% of the one-time askers did not rate the answer only 17.5% of the continuing askers did not rate their answer.

Tip: the range of allowed tip in GA was between U.S.$0 (44.9% of the sample) and U.S.$100 by the system design. On average, continuing askers provided a tip of U.S.$1.89 per answer (SD = 7.46) and one-time askers tipped U.S.$1.03 per answer (SD = 4.96). This is less than a 'small' effect with Cohen's $d = 0.14$ (a 'small' effect is defined as $d = 0.2$). Nevertheless, the effect is somewhat stronger than the effect seen for price and response time. A χ^2 test indicates that there is a dependence between the level of tip per answer and the tendency of the asker to be a one-time asker or a continuing asker ($\chi^2 = 280.02$, DF = 4, $P < 0.001$). While 74.2% of the one-time askers paid no tip, only 25.8% of the continuing askers did not pay any tip.

Tip Text: 72.2% of all the answers did not get any tip text. A χ^2 test indicates that there is a dependence between provision of tip text following the answer and the tendency of the asker to be a one-time asker or a

continuing asker ($\chi^2 = 927.70$, DF $= 1$, $P < 0.001$). While 51.3% of the one-time askers did not send tip text, only 28.3% of the continuing askers did not send tip text.

To summarize the descriptive statistics section, at the start of the Q&A process there are no differences between the two groups with regard to the price bid and response time for obtaining an answer. A first difference between the two groups emerges during the question processing and answering, and is expressed as a difference in number of comments provided for the questions posted by each group of askers. Finally, the feedback provided following the receipt of an answer differs between the two groups in all three variables, Tip, Tip Text, and Rating.

Research model

The theoretical research model proposed in Figure 1 was tested using the AMOS Structural Equation Modeling software version 17.0. Figure 3 depicts the structural relationships among the study's variables. Table 1 displays the means and standard deviations of the variables. The inter-correlation matrix is exhibited in Table 2. A latent variable, labeled 'Satisfaction', represents the shared variance of three indicators that capture users' feedback after receiving an answer (tip, tip text, and rating). Convergent validity of satisfaction is based on the loading of the items to the latent variable: tip – 0.63, tip text – 0.91, and rating – 0.92, and on confirmatory reliability testing: Cronbach's $\alpha = 0.77$. In order to further evaluate the measurement properties of the latent variable we calculated the Average Variance Explained (AVE) and conducted a principal components analysis (PCA). AVE was 0.46 and PCA results indicated a large eigenvalue (2.08) for the first component, explaining 69.4% of the total variance (no other component had
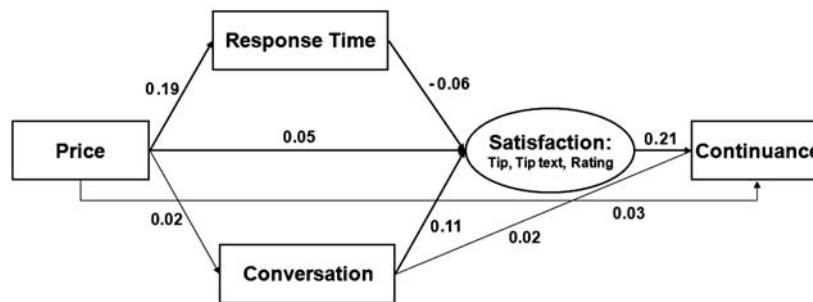

Figure 3 Outcome of the research model.

Table 1 Descriptive statistics of the variables in the model

Variable	Full population (N = 27368)	Single question (N = 19770)	More than 1 question (N = 7598)	T
	Mean (SD)	Mean (SD)	Mean (SD)	(DF = 27366)
Price	3.68 (2.57)	3.61 (2.56)	3.84 (2.58)	6.40***
Response time	1.65 (1.68)	1.66 (1.70)	1.62 (1.64)	1.55
Comments	1.01 (1.63)	0.96 (1.57)	1.12 (1.77)	7.19***
Tip	0.30 (0.77)	0.25 (0.72)	0.41 (0.88)	15.36***
Rating	2.51 (2.34)	2.20 (2.34)	3.29 (2.16)	35.14***
Tip text	0.47 (0.50)	0.41 (0.94)	0.62 (0.49)	30.99***

****$P < 0.001$.

Table 2 Inter-correlations matrix of the variables in the model

	Price	Response time	Comments	Tip	Rating	Tip text
Price						
Response time	0.19***					
Comments	0.02***	0.12***				
Tip	0.14***	0.04***	0.11***			
Rating	0.02***	−0.05***	0.09***	0.3***		
Tip text	0.06***	−0.03***	0.12***	0.36***	0.83***	
Continuance	0.04***	−0.01	0.04***	0.09***	0.21***	0.18***

***$P < 0.001$.

an eigenvalue exceeding 1). Although the AVE falls a bit short of the recommended value of 0.5, these results taken together provide evidence for the usefulness of the latent variable in our model. Taking into account the good fit indices for the entire model we presented, we conclude that our conclusions are adequately supported by the empirical analyses. Subsequent studies are of course needed for a more rigorous investigation of the construct validity of the satisfaction variable in our model and replication of the present study substantive conclusions.

The rest of the variables in the model were directly observed: initial price, response time, spontaneous comments by non-expert users in response to initial questions, and user's return to submit another question. Only statistically significant paths are shown ($P < 0.001$). The practical significance of certain paths is explained in the 'Discussion'. Fit indices indicated a good fit of the model to the data: $CFI = 0.97$; $NFI = 0.97$; $RMSEA = 0.07$.

The formal hypotheses called for the formation of the latent variable, satisfaction. In this way the separate role of each of the feedback mechanisms is not known. To overcome this 'black box', three logistic regressions in blocks (block 1 = price, block 2 = response time and comments) were performed, one for each feedback mechanism. The outcomes are not detailed as these analyses were not part of the formal hypotheses testing; however, the regressions revealed that all three feedback mechanisms were equally predicted by all three predictor variables. The relation with response time was inverse, providing evidence that the effects of price and time tend to cancel each other, thus making the contribution of comments critical to the feedback in all its forms. An additional, fourth, regression in blocks was run in order to explore the relations of the individual predictor variables with the dependent variable, continuance (block 1 = price, block 2 = response time and comments, block 3 = tip, tip text, rating). Results of this regression showed that continuance was very weakly predicted by price, response time, and comments. The feedback mechanisms, mainly rating and tip text, provided most of the explained variance of continuance.

Discussion

This study drew upon the expectation-confirmation or disconfirmation theory (ECT/EDT) in order to suggest that when information is the product or service in the market, social interaction is a crucial antecedent of satisfaction, which ultimately leads to re-purchase (continuance) in the market for information. In other words, social activity promotes the sustainability of this information market. The findings of the present research extend the ECT/EDT, which claims that satisfaction with a product or service is the primary motivation for its continued use (Oliver, 1980) by identifying social interaction as a component of satisfaction in a Q&A service.

Figure 3 reveals that all relations were statistically significant; however, most had very low β values meaning that the practical significance of those associations is probably low. Three relationships stand out compared with the others: price predicts response time, conversation predicts satisfaction, and satisfaction predicts continuance. The latter two connections mean that social interaction (comments) leads to increased likelihood of the asker to keep on using the Q&A service mediated by satisfaction. Conversation has a direct effect on continuance but a stronger effect, which is mediated by satisfaction. The logistic regression performed to discern the influence of each feedback mechanism on continuance revealed that the amount of tip paid had the least influence. This provides even further support to the notion that social processes are at work here: more conversation leads to more satisfaction, which generates continuance; however, continuance is predicted mainly by the provision of rating and tip text, not the monetary compensation by tips.

Interestingly, the direct effect between price and satisfaction is weak, in contrast to ECT/EDT. This may be the result of the unique nature of information services compared with other services, which relates to the perception of response time. For example, in a fast food restaurant one expects fast service; however, when asking a question, one may perceive a long response time as a cue for effort in preparing a thorough answer. The significant positive relation between price and response time supports this idea. This finding is not trivial because we may have expected the GAR to answer faster as the monetary incentive increases. The positive correlation between the question price and the response time suggests that the askers are able to correctly estimate the complexity of the questions and effort that the answerer will need to make in order to answer. Complexity and effort are translated to the amount of time needed to provide the answer.

The weak negative relation between response time and satisfaction supports the traditional view that wait time and consumer satisfaction are inversely related (Carmon et al, 1995). Perhaps the overall low correlation between price and satisfaction reflects the ambiguity or tension between a natural inclination to prefer a low price (which is likely to correlate well with satisfaction), and the realization that the price acts as a signal to the answerer with a positive relation between price and response time and resulting quality of answer. The tension between negative and positive correlation relating to response time results in virtually no correlation between price and satisfaction.

The main predictor of the level of satisfaction is the number of comments per question provided before the paid answer ($\beta = 0.11$). Receiving more comments leads the asker to express more satisfaction. The exchange of comments is a social process that is more conducive to information sharing than an interaction with a database or IS (Rafaeli & Raban, 2005). Human interaction

increases satisfaction according to this interpretation. In addition, the comments provide the pooled knowledge of several GA participants beside the asker and the GAR. Collective wisdom may generate more satisfaction than an answer by a single professional (Harper *et al*, 2008).

Overall, the β values in the model are fairly low. This may be a weakness of the current findings, but put in perspective this is not so. Earlier work about the link between satisfaction and continuance found much higher β values for this specific known relationship. The present links are weaker probably because field data were used, and as such it was not filtered. Had the data set been trimmed by certain parameters, for example, by taking only those Q&A sets that received feedback, the model may have resulted in stronger links. The weak link for the known relationship, satisfaction-continuance, implies that the weak link of the new relationship, conversation-satisfaction, is a significant research finding as is the link between price and response time.

Limitations and future research

Research that relies on actual data from a web site can be much more accurate and valid than research that relies on surveys and other methods of self-report owing to the unbiased nature of the data. On the other hand, using data of these kind prevents us from observing additional variables that can explain some of the variance in the tendency to continue using an IS. For example, individual customer characteristics such as personality, cognitive beliefs, affects, motivations, and socio-demographic variables are known to affect satisfaction (Mittal & Kamakura, 2001). The lack of these kind of data is likely one of the reasons for the low but significant correlation in our research model. Another reason is probably the inherent low loyalty in digital environments (Qureshi *et al*, 2009). On the basis of prior ECT/EDT work it is likely that the quality of the content itself is one of the predictors of satisfaction; however, content analysis was not within the scope of the current study. Future research may combine participant characteristics and content analysis variables with field data or controlled field experiments to obtain a more detailed picture of the factors at play in such hybrid information exchange environments.

Another limitation of this research is its correlative nature. The use of correlative data, as opposed to experimental data, does not indicate the direction of the effects. Generally, the study presented here used the sequence of the users' actions as an indication for the direction of the model allowing us to draw directional conclusions.

Some of the links in the model are statistically significant but very weak, as expressed in low β values. As indicated earlier, even links that are known to be strong in the literature (satisfaction-continuance) are much weaker in the present work. It is suggested that the weaker links (price-satisfaction, price-continuance, and conversation-continuance) be more closely and specifically examined in future research, possibly through a controlled study of information consumption.

Taking a broader view of the current findings, it seems that despite the wealth of observations, it is challenging to provide a broad theoretical basis to explain such unobtrusive data. Future research may employ different data selection procedures, for example, by performing similar analyses on subsets of the entire data or by applying specific constraints for data selection. The advantage of the current study is that it accounts for the full range of data; however, there may be an advantage in conducting a more focused analysis in future studies of GA or other participatory web sites. In addition, research based on unobtrusive methods may be augmented by additional research methods such as interviews, surveys, or controlled experiments. Lastly, a comparative study covering a number of web sites may aid in expanding our understanding of how satisfaction is formed in the online environment.

Conclusion

The present findings show that there was no *a priori* difference between one-time askers and continuing askers in terms of their price bids and in terms of the time devoted to the answers provided to these respective groups. When users send questions to GA for the first time they do not know if they will continue using the system to send additional questions. The tendency to keep on using it stems from their satisfaction fueled by the social interaction and satisfaction by the answer.

There was only a weak link between the price bids and the tendency to continue using the GA service. Most of the effect of the prices was mediated via the response time and the satisfaction. Satisfaction was predicted mostly by conversation. Conversation enables information sharing and motivates repeated business in the form of fee-based answers. Conversation plays a dual role: provision of bits of information and interactivity, which invites more interest and more activity, creating an amiable environment, which generates more commitment, trust, and credibility. A positive asker experience was expressed by the components of satisfaction and ultimately led to higher likelihood of continuance. Each of the feedback mechanisms was related to a higher chance of continuing to use the service, although as the model is correlative we cannot determine whether the use of feedback mechanisms is the result of satisfaction or whether people who tend to use such mechanisms are more socially oriented and more used to the online environment and the tools it offers them.

The important outcome of this study is that comparing two groups of GA participants, one-time askers and returning askers, both groups came with equal expectations (represented by price), and received equal service (represented by response time). The returning askers continued to use the system because they were satisfied

with it. Satisfaction was improved by conversation. Referring back to the paper's introduction, free activity is an integral part of the service even in a fee-based information market. Moreover, free activity, especially social interaction, actually feeds into the site's activity improving continuance and thereby leading to measurable outcomes for the commercial owners of the site.

About the author

Daphne R. Raban is a senior lecturer at the Graduate School of Management, University of Haifa and Head of the Department for Information & Knowledge Management. She is active in the Sagy Center for Internet Research and is a partner of the FP7-ICT Socios project. Her broad area of research interest is the value of information including topics such as economics of information goods, information markets, information/knowledge sharing, the interplay between social and economic incentives, and games and simulations (http://gsb.haifa.ac.il/~draban/home/).

References

ADAMIC LA, ZHANG J, BAKSHY E and ACKERMAN MS (2008) Knowledge sharing and yahoo answers: everyone knows something. *Proceeding of the 17th International Conference on World Wide Web*, Beijing, China, pp 665–674.

ANDERSON C (2009) *Free! Why $0.00 is the Future of Business*. Hyperion, New York.

ANDERSON RE (1973) Consumer dissatisfaction: the effect of disconfirmed expectancy on perceived product performance. *Journal of Marketing Research* **10**(1), 38–44.

BHATTACHERJEE A (2001a) An empirical analysis of the antecedents of electronic commerce service continuance. *Decision Support Systems* **32**(2), 201–214.

BHATTACHERJEE A (2001b) Understanding information systems continuance: an expectation-confirmation model. *MIS Quarterly* **25**(3), 351–370.

CARMON Z, SHANTHIKUMAR JG and CARMON TF (1995) A psychological perspective on service segmentation models: the significance of accounting for consumers' perceptions of waiting and service. *Management Science* **41**(11), 1806–1811.

CHIU CM, HSU MH, SUN SY, LIN TC and SUN PC (2005) Usability, quality, value and e-learning continuance decisions. *Computers & Education* **45**(4), 399–416.

COHEN J (1992) A power primer. *Psychological Bulletin* **112**(1), 155–159.

CONNOLLY T and THORN BK (1990) Discretionary databases: theory, data, and implications. In *Organizations and Communication Technology* (FULK J and STEINFIELD CW, Eds), pp 219–233, Sage Publications, Newbury Park.

DAVIS FD, BAGOZZI RP and WARSHAW PR (1989) User acceptance of computer technology: a comparison of two theoretical models. *Management Science* **35**(8), 982–1003.

DELONE WH and MCLEAN ER (2003) The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems* **19**(4), 9–30.

EDELMAN B (2004) Earnings and ratings at Google answers. Unpublished manuscript.

HARPER MF, RABAN DR, RAFAELI S and KONSTAN J (2008) Predictors of answer quality in online Q&A sites. In *Twenty-sixth Annual SIGCHI Conference on Human Factors in Computing Systems*, pp 865–874, Florence, Italy.

HSIEH G, KRAUT RE and HUDSON SE (2010) Why pay?: exploring how financial incentives are used for question & answer. *Proceedings of the 28th International Conference on Human Factors in Computing Systems*, Atlanta, GA, pp 305–314.

JIANG Z, WANG W and BENBASAT I (2005) Multimedia-based interactive advising technology for online consumer decision support. *Communications of the ACM* **48**(9), 93–98.

KUMAR N and BENBASAT I (2002) Para-social presence: a reconceptualization of 'social presence' to capture the relationship between a web site and her visitors. *Proceedings of the 35th Hawaii International Conference on System Sciences*. Computer Science Press, Washington DC.

MITTAL V and KAMAKURA WA (2001) Satisfaction, repurchase intent, and repurchase behavior: investigating the moderating effect of customer characteristics. *Journal of Marketing Research* **38**(1), 131–142.

OLIVER RL (1980) A cognitive model of the antecedents and consequences of satisfaction. *Journal of Marketing Research* **17**(4), 460–469.

ONG C, DAY M and HSU W (2009) The measurement of user satisfaction with question answering systems. *Information & Management* **46**(7), 397–403.

PATTERSON PG, JOHNSON LW and SPRENG RA (1997) Modeling the determinants of customer satisfaction for business-to-business professional services. *Journal of the Academy of Marketing Science* **25**(1), 4–17.

QURESHI I, FANG Y, RAMSEY E, MCCOLE P, IBBOTSON P and COMPEAU D (2009) Understanding online customer repurchasing intention and the mediating role of trust an empirical investigation in two developed countries. *European Journal of Information Systems* **18**(3), 205–222.

RABAN DR (2007) User-centered evaluation of information: a research challenge. *Internet Research* **17**(3), 306–322.

RABAN DR (2008a) The incentive structure in an online information market. *Journal of the American Society for Information Science and Technology* **59**(14), 2284–2295.

RABAN DR (2008b) The incentive structure in an online information market. *Journal of the American Society for Information Science and Technology* **59**(14), 2284–2295.

RABAN DR (2009) Self-presentation and the value of information in Q&A web sites. *Journal of the American Society for Information Science and Technology* **60**(12), 2465–2473.

RABAN DR and RABIN E (2009) Statistical inference from power law distributed web-based social interactions. *Internet Research* **19**(3), 266–278.

RAFAELI S and NOY A (2005) Social presence: influence on bidders in internet auctions. *EM – Electronic Markets* **15**(2), 158–176.

RAFAELI S and RABAN DR (2005) Information sharing online: a research challenge. *International Journal of Knowledge and Learning* **1**(1/2), 62–79.

REGNER T (2005) Why voluntary contributions? Google answers!. CMPO Working Paper Series, Working Paper No. 05/115.

RESNICK P, KUWABARA K, ZECKHAUSER R and FRIEDMAN E (2000) Reputation systems. *Communications of the ACM* **43**(12), 45–48.

RESNICK P, ZECKHAUSER R, SWANSON J and LOCKWOOD K (2006) The value of reputation on eBay: a controlled experiment. *Experimental Economics* **9**(2), 79–101.

SHAPIRO C and VARIAN HR (1999) *Information Rules: A Strategic Guide to the Network Economy*. Harvard Business School Press, Boston.

TAYLOR S and TODD PA (1995) Understanding information technology usage: a test of competing models. *Information Systems Research* **6**, 144–176.

VAN ALSTYNE MW (1999) A proposal for valuing information and instrumental goods. *Proceedings of the 20th International Conference on Information Systems*, pp 328–345, Charlotte, North Carolina.

WIXOM BH and TODD PA (2005) A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research* **16(1)**, 85.