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E-commerce success criteria: determining which criteria count most

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Abstract We explore in this paper how performance of e-commerce websites in terms of various criteria influences customers' intention to shop again in the same website. Our approach is based on an interesting use of statistical regression in the hotel literature that attempted to classify different cues in hotels as critical, satisfier, dissatisfier, etc. We use online ratings for 484 e-commerce websites for this study. Our study shows that "satisfaction with claims" is the single most important criterion valued as critical by online customers. "Comparative prices" and "Refunds/returns" are desirable criteria. "Management accessibility", "Payment process" and "Privacy experience" are satisfiers while "on-time delivery" is a dissatisfier.

Keywords E-commerce success criteria · Classifications · Online ratings · Customer loyalty

1 Introduction

E-commerce has shown impressive growth in the last few years but the rate of growth is slowing down. For example, according to the US Census Bureau of the Department of Commerce, e-commerce retails sales grew by 13.6% in the US for the first quarter of 2008 compared to the same quarter the previous year, but this growth is small compared to the fantastic e-commerce sales growth of 51% in the first quarter of 2001 compared to the first quarter of 2000. It is argued that, with the pricking of the Internet bubble, many e-tailers are looking to develop sophisticated strategies to build customer loyalty and sales. Of related interest is the use of information from customers to assess the importance of product or service attributes that would stimulate

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customer loyalty and repeat purchase [17]. The literature on operations management, marketing, and management science has a number of studies addressing this important issue, both in traditional and in e-commerce contexts.

In the context of electronic marketplaces, several studies have stressed the importance of various performance criteria in determining customer retention and loyalty and ultimately the success of firms [3]. For example, effectiveness of fulfilling orders on time has been stressed by Lee and Whang [18]. The importance of quality of physical distribution in the "last-mile" of e-commerce has also been stressed [18, 22]. Though it has been agreed that these performance criteria are important, the literature has also stressed the need for understanding the relative contribution of these criteria towards customer loyalty. Several studies have been reported on the empirical analysis of identifying the significance of different criteria on customer loyalty [7, 8].

The issue of identifying the drivers of customer loyalty is not unique to e-commerce firms involved in retail business. There is a growing literature in the hotel industry for identifying the relative importance of performance levels of various employee groups in influencing guest perceptions of hotel service quality and customer loyalty [1, 2, 6, 23]. Cadotte and Turgeon [1] have identified that some service categories in a hotel could earn compliments or receive complaints depending on good or bad performance, and classified them into four categories: criticals, satisfiers, dissatisfiers, and neutrals. Silverman and Grover [23] have categorized services offered by different employees in a hotel as necessary, desirable and passive. Chu and Choi [2] have categorized service attributes in terms of their perceived importance and actual performance levels into four quadrants: good work (high importance and high performance), overkill (low importance but high performance), low priority (low importance and low performance), and concentrate (high importance but low performance).

In this paper, we adapt this literature on hotels to the e-commerce retailing context and attempt to provide a similar classification (critical, satisfiers, etc.) of e-commerce performance criteria.

2 Literature survey

2.1 E-commerce success criteria

Though e-commerce and the so called e-tailing are relatively recent phenomena, much has been written about the customer service criteria and quality measurement in e-tailing [3, 12]. In general, customers use a variety of criteria to judge the quality of a website involved in e-commerce activity.

A good website should have a simple design and should be easy to understand and use. Regular updates are necessary for e-commerce sites to reflect the changing availability of products, changes to information, addition of new products and deletion of obsolete products. Technical availability of the website is also very important. Provision of appropriate and correct product information is very important in deciding the quality of an e-commerce website.

Customers experience some more criteria when they actually make their purchase. For example, the privacy while giving personal information and security when giving financial information are important. There have been research studies on the role played by these web-assurance seals in improving customer confidence of a website, which generally point to a positive role [20]. Legal matters are also important in promoting secured online transactions [26].

After-sales and support services play an important role in deciding customer loyalty. Physical delivery is a very important component here. A customer receiving the right product at the right time that exactly matches product specifications would be happy. This criterion is mostly related to the logistics component of e-commerce transactions. This includes receiving proper receipts for payment, documents, all the items ordered and not receiving anything not ordered by the customer. Much has been written about this "last mile" of Internet supply chains [4, 16, 18]. Late arrival of the product would often make customers wait for the product with compounded anxiety levels. A dedicated customer support team is necessary to deal with service failures, if and when they occur. It is important that the goods reach customers from warehouses without damage. There are research studies that showed that companies that used reliable carriers for delivery tended to have better patronage from customers [7]. Adequate arrangements to process the products returned by customers is becoming increasingly important in the competitive market.

Thus, the literature discusses several criteria for deciding customer loyalty in e-commerce transactions. There are also more detailed studies that attempted to identify the relative contribution of these criteria in deciding customer loyalty [10, 14, 24, 25, 27, 28]. Torkzadeh and Dhillon [25] have developed detailed measurement scales for measuring the influence of e-commence success factors in the success of e-commerce using the value-focussed thinking developed by Keeney [13, 14]. Wade and Nevo [27] developed measurement scales for measuring e-commerce performance, while Zhuang and Lederer [28] developed an instrument for measuring business benefits of e-commerce. Hui and Wan [10] focused on gender related factors while Siyal et al. [24] focused on socio-economic criteria leading to e-commerce success.

As mentioned earlier, just like the e-commerce literature, there is a growing literature on hotel performance that also aims to identify the relative contribution of various success factors in deciding customer loyalty. In this paper, we adapt some of these studies in the hotel literature for measuring the relative contribution of e-commerce performance criteria. Hence, we briefly review below the relevant literature on classifying customer loyalty criteria in the hotel literature.

2.2 Literature on classifying customer loyalty criteria in hotels

Customers use a variety of criteria to judge the quality of service that they receive during their stay in a hotel. It has long been recognized that these factors in a hotel differ in terms of their ability to win compliments or result in complains from guests. An understanding of which criteria will enhance compliments or which criteria will result in complaints is important for the management to improve overall customer

satisfaction and ensure customer loyalty. Several studies have been reported that attempt to provide appropriate classifications of service criteria/attributes/factors in a hotel using this premise.

Using data from a restaurant and lodging survey, Cadotte and Turgeon [1] have classified service criteria into four categories: criticals, satisfiers, dissatisfiers, and neutrals. Critical criteria usually have high potential for compliments and high potential for complaints, and the authors found that the quietness of rooms in a hotel and the quality of food in restaurants are usually classified in this category. They represent both a threat and an opportunity to the management. Satisfiers are those criteria where unusually good performance elicits compliments from guests while average or low performance will generally not elicit dissatisfaction from guests. Examples include hotel lobbies or large portions of food in restaurants.

Using the theory of Importance-Performance Analysis (IPA), Silverman and Grover [23] have classified hotel service criteria as necessary, desirable, and passive to explain the ability of the criteria in shaping the overall quality perceptions. Necessary criteria have to be functioning properly in order that the overall quality of a hotel is judged as high quality. Desirable criteria add to the baseline perceptions of quality if they are good; otherwise they may tend to reduce quality perception but not to a point where overall quality is judged as poor. Passive criteria are generally not solicited by guests. The same IPA framework has been employed by Chu and Choi [2] to identify the perceived importance levels of six hotel selection factors by business and leisure guests in Hong Kong.

More recently, Hartline et al. [6] have combined the ideas of Cadotte and Turgeon [1] and Silverman and Grover [23] to classify performance of different groups in hotels as necessary, desirable or neutral. Based on a primary survey, they have found that the performance of front desk personnel is a necessary cue in order to ensure good perceptions of quality. They have also found that the performance of housekeeping and parking are desirable cues, while the performance of room service and bell staff are neutral. In contrast to previous studies, the authors have adopted an interesting use of regression analysis to base their classifications. Their approach has involved running separate regressions for high performance (above median) and low performance (below median) in terms of each of the service attributes. This approach is adapted in the present study and will be discussed in more detail in Sect. 3.2 on empirical analysis.

We believe that the e-commerce literature will benefit by drawing on the classification scheme in the hotel literature. First of all, the notions of satisfier or dissatisfier are equally valid in e-commerce context; managers of e-commerce websites would be benefited if they knew that good performance in some operational criteria would be viewed by customers positively and unsatisfactory performance may not be viewed negatively. It would help if managers know that some criteria are considered critical where an unsatisfactory performance cannot be compensated by better performance in terms of other factors. Most of the studies on e-commerce operational factors [8, 11, 27] have adopted a traditional use of statistical regression and related methodologies to identify whether a criterion is significant in explaining customer loyalty (or some other measure of overall performance). While these studies have provided interesting results, they could not develop the notions of satisfiers,

Table 1 Proposed classification scheme for e-commerce performance criteria

Classification	Definition	Examples from the Hotel literature
Critical	Critical criteria usually have high potential for compliments and high potential for complaints. An unsatisfactory performance in critical criteria cannot be compensated by better performance in terms of other criteria.	• Performance of front desk personnel in a hotel • Quietness of rooms in a hotel • Quality of food in restaurants
Desirable	Desirable criteria add to the baseline perceptions of quality if they are good; otherwise they may tend to reduce quality perception but not to a point where overall quality is judged as poor.	• Performance of housekeeping in a hotel • Parking in a hotel
Satisfier	Satisfiers are those criteria where unusually good performance elicits compliments from guests while average or low performance will generally not elicit dissatisfaction from guests. These provide an incentive to improve performance as these performances will be rewarded by customers.	• Hotel lobbies • Large portions of food in restaurants
Dissatisfier	Dissatisfiers are those criteria where unusually bad performance results in dissatisfaction while average or low performance will generally not generate satisfaction from customers. Minimum performance in terms of these criteria must be maintained, but these criteria do not warrant additional efforts to achieve high performance as these efforts may be better spent on satisfier or critical criteria that will be noticed by customers.	• Parking in a restaurant • Variety of credit card options in a restaurant
Neutral	Neutral criteria are generally not solicited by guests. Good performance in terms of these criteria may not be noticed by customers, and bad performance may reduce perceptions of service quality but not to a point where overall quality is judged as poor.	• Performance of room service in a hotel • Performance of bell staff in a hotel

Sources: Based on Ref. [1, 6, 23]

dissatisfiers, etc. In this paper, we attempt to classify e-commerce performance criteria similar to the classification scheme available in the hotel literature. We adopt an innovative use of statistical regression drawn from Hartline et al. [6].

We have synthesized previous studies in the hotel literature and developed the classification scheme shown in Table 1. As the table shows, customers to e-commerce websites may consider performance in terms of some criteria as critical—a poor performance in these criteria cannot be compensated by better performance in terms of some other criteria. Depending on the extent of impact on customers' perceptions,

criteria can also be classified as desirable (if good performance in terms of the criteria improve customers' perceptions and bad performance adversely affect perceptions), satisfier (if good performance improve customers' perceptions but bad performance does not significantly alter perceptions), dissatisfier (if good performance does not significantly alter perceptions but bad performance significantly adversely impact perceptions), or neutral.

The aim of the present study is to use the regression methodology adopted by Hartline et al. [6] to classify e-commerce performance criteria as per the classification scheme shown in the table.

3 Data and empirical analysis

3.1 Data

Data used in our analysis has been obtained from the online rating site, www.epubliceye.com, during 2006-07. Features of this website and the suitability of data from this website for empirical analysis have been discussed in detail by Heim and Field [7]. This online rating site is a data infomediary service firm founded in 1996. We decided to use the ratings from this website because, compared to other similar sites such as www.bizrate.com, www.epinions.com, etc., this rating site contains a broader list of e-commerce assessment criteria. We believe that this rating site could provide a representative sample for our study because, as per its website (http://www.epubliceye.com/eye2-1.htm accessed on 14 Oct. 09), it has coverage in large number of (96) countries.

The criteria employed by epubliceye.com for rating e-commerce websites are listed in Table 2. They are collected from customers at several points of the shopping process—before and after purchase, and cover a range of relevant issues related to e-commerce operations. Customers are asked to give a ratings for very bad and for very good performances in terms of the criteria. The ratings are aggregated and normalized such that the highest rating is 1 (or 100%) for best performance.

Ratings for a total of 484 e-commerce websites were used in the study. Table 3 provides overall summary of the data. Customer support had the largest spread of ratings with a website receiving a rating as low as 0.010. Many websites received the highest possible rating of 1 in terms of payment process, privacy experience, satisfaction with claims, on-time delivery and customer support. Mean ratings were all above 0.9. All the criteria had high correlations with each other.

3.2 Empirical analysis

We now describe our analysis to classify e-commerce service criteria in terms of satisfier, dissatisfier, etc. in line with similar previous studies in hotel literature. We have adopted the regression based classification methodology of Hartline et al. [6] to carry out this classification. Their approach involved first running a multiple linear regression with customer loyalty as the dependent variable and performance criteria as the independent variables for the whole data set, and then running separate regressions for high performance (above median) and low performance (below median) in

Table 2 Definitions of e-commerce success factors and customer loyalty from www.epubliceye.com

Criterion	Description
Management Accessibility	This category allows consumers to rate how easily they were able to contact management or someone in charge with inquires or problems that required live support. The resulting rating is the merchant's trend of management accessibility.
Payment Process	This category allows consumers to rate their satisfaction with how their order was processed. The resulting rating is the merchant's trend of satisfied customer transactions.
Privacy Experience	This category allows consumers to rate their experience with the privacy practices of the business relative to their privacy policy. Was the company's handling of your personal information acceptable to you? The resulting rating is the merchant's trend of honouring its privacy policies based solely on customer experience.
Comparative Prices	An explicit definition is not available in the website. However, this criterion has been interpreted in this study as the relative attractiveness of a website in offering products of same quality at lowest possible prices.
On-time Delivery	This category allows consumers to rate the fulfilment practices of the merchant. Was the product in stock? Did it arrive in the time period promised? Was the service delivered on schedule? The resulting rating is the merchant's trend of order fulfilment.
Customer Support	This category allows consumers to rate how well the merchant stands behind their product or service after the sale. The resulting rating is the merchant's trend of customer support.
Ease of Returns/ Refunds	This category allows consumers to rate the returns and refund practices of the business. Did the company handle returns as promised? The resulting rating is the merchant's trend of ease of returns.
Satisfaction with Claims	This category allows consumers to rate their experience with the reliability of the advertising and product claims made by the merchant. Based on customer experience, did the product or service do what it promised to do?
Customer Loyalty	This category allows consumers to indicate their likelihood of shopping with the merchant again. The resulting rating is the merchant's trend of customer loyalty.

terms of each of the performance criteria. The assessment of whether a performance criterion is necessary or satisfier etc. is done based on the results.

For all the regressions discussed below, we have included a dummy variable to represent the industry type (vehicles, books, etc.) as a control variable. We first carried out the usual tests to check whether the assumptions of regression are valid for the data. We have tested for normality assumption of the error terms, checked for the presence of outliers in the data and checked for multi-collinearity and heteroskedasticity. We have verified and found that all assumptions for regression are satisfied. In spite of significant correlations among performance criteria, there was no evidence of multi-collinearity with all variable-inflation factors below the threshold of 5 [5]. We wish to highlight here that we initially started with a larger data set of 538 websites but some of our regressions showed larger variable inflation factors above 5. We have discussed our experiences of dealing with multicollinearity in the Appendix.

Table 3 Descriptive statistics of the data (Sample size: 484)

	Customer loyalty	Management accessibility	Payment process	Comparative prices	Privacy experience	Satisfaction with claims	On-time delivery	Customer support	Refunds/ returns
Customer Loyalty	1.000								
Management accessibility	.743	1.000							
Payment process	.724	.707	1.000						
Comparative prices	.453	.328	.422	1.000					
Privacy experience	.582	.505	.677	.415	1.000				
Satisfaction with claims	.808	.737	.727	.484	.503	1.000			
On-time delivery	.511	.459	.479	.313	.419	.429	1.000		
Customer support	.509	.615	.425	.224	.317	.539	.304	1.000	
Refunds/returns	.397	.377	.262	.266	.266	.415	.168	.329	1.000
Minimum	0.886	0.720	0.738	0.819	0.560	0.817	0.167	0.010	0.500
Maximum	0.999	0.999	1.000	0.999	1.000	1.000	1.000	1.000	0.999
Mean	0.959	0.949	0.954	0.943	0.930	0.956	0.917	0.948	0.944
Std. Deviation	0.026	0.041	0.031	0.029	0.036	0.030	0.117	0.064	0.069

Table 4 Result of overall regression for all the 484 e-commerce websites (Dependent variable: Customer Loyalty)

Intercept	Management accessibility	Payment process	Comparative prices	Privacy experience
0.232***	0.135***	0.082**	0.033	0.083***

Satisfaction with claims	On-time delivery	Customer support	Refunds/ returns	Industry	Max VIF
0.382***	0.025***	0.004	0.021**	0.0002	3.37

($R^2 = 0.742$, R^2 adj. $= 0.7372$, $F = 151^{***}$ and Sample size $= 484$)

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.10$

For a criterion to be classified as critical, it has to be significant in explaining customer loyalty when all the data are used in the regression analysis. We present the result of multiple regression for all the 484 websites in Table 4. We have used customer ratings on customer loyalty as the dependent variable and customer ratings in terms of other performance criteria (see Table 2) as independent variables. The regression is significant as shown by the high value of F-statistic ($= 151$), which, as the triple asterisks next to it shows, is highly significant at 1% level. The value of R^2 is also high (0.742) signifying that the independent variables are able to explain 74.2 percent of variability in the dependent variable. The last column shows information about variable inflation factor (VIF). As mentioned earlier, a high value of VIF, above 5, indicates problems with multicollinearity. However, the regression reported in this table does not show such a serious evidence of multicollinearity. The regression will generate a variable inflation factor for each independent variable. VIF was very low for the industry dummy (VIF = 1.041), VIF for other independent variables were higher (e.g., VIF for "Management accessibility" was 3.145) while the value was the highest for "Payment process" (VIF = 3.370). The highest VIF value is reported in Table 3. Thus the highest value is 3.37, which is well below the threshold of 5, indicating no problems with multicollinearity in the regression.

Table 4 shows that the constant term of the regression (intercept) is significant with a value of 0.232 at 1% level (shown by the triple asterisks, which as the footnote to the table explains is interpreted as $p < 0.01$). The dummy variable for the type of industry is not significant. The unstandardized coefficient for criterion "Management accessibility" has a value of 0.135 and this criterion is also significant at 1% level. Other entries of this table can be interpreted in a similar way. It is evident from the table that four criteria namely "Management accessibility", "Privacy experience", "Satisfaction with claims" and "On-time delivery" are highly significant at 1% level, and two more criteria namely "Payment process" and "Refunds/returns" are significant at 5% level in explaining the willingness of customers to shop again in the same website. The other two criteria namely "Comparative Prices" and "Customer support" are not significant in explaining the willingness of customers to shop again in

the same website. Thus, these two criteria are provisionally considered as desirable criteria while all others are provisionally considered critical criteria.

Results of regressions for low performance (equal to and below median) and high performance (above median) of each of the e-commerce criteria are shown in Tables 5 and 6 respectively. As in Table 4, we have used customer ratings on customer loyalty as the dependent variable, and, customer ratings in terms of other performance criteria and the industry dummy as independent variables in these regressions as well. All the regressions shown in Tables 5 and 6 are statistically significant as the F-statistic values are highly significant at 1% level.

The entries in the first row of Table 5 should be interpreted as follows. The first row "Management Accessibility" indicates that this regression was run with the low performance (equal to and below median) in terms of this criterion. The entire data was first sorted using ratings in terms of this criterion, and the median score was calculated. The median score was 0.9533, meaning that approximately 50% of websites received ratings above and below this median score. Then all websites that registered a rating equal to and less than this median score in terms of "Management accessibility" were considered in the regression. As the first row of Table 5 shows, 242 websites received a rating equal to and below the median score in terms of this criterion. As in Table 4, the numbers in the row indicate the values of unstandardized regression coefficients. The level of significance is denoted by the asterisks near the coefficient values. Thus the constant term (intercept) is significant at 1% level, "Management accessibility" is not significant, and "Payment process" is highly significant at 1% level. Significance of other criteria can be interpreted in a similar way. The last column in the first row shows that the maximum VIF for this regression is 3.135, indicating that multicollinearity is not a serious concern here.

Second row of Table 5 shows the results of regression when only those websites that received below-median ratings in terms of the criterion "Payment process" are considered. Other rows of Table 5 can be interpreted similarly. Similarly, all the rows in Table 6 pertain to regressions on websites that received above-median ratings in terms of criteria shown in different rows.

For a critical criterion, it is important that the regression with low performance in terms of the criterion will find none of the criteria to be significant. However, Table 5 shows that none of the regressions have found all the criteria to be insignificant. Another requirement for a critical criterion is that it should remain significant in all the regressions in Tables 5 and 6. We find the criterion "Satisfaction with claims" meets this second requirement. Hence, we classify this as the critical criterion, and provisionally classify all other criteria as desirable.

To be confirmed as a desirable criterion, the regressions with high as well as low performances in terms of the criterion should show that criterion as significant. This means, a desirable criterion is interpreted as the one where a low performance in terms of the criterion significantly reduces customer loyalty or a high performance significantly improves customer loyalty. It may be noticed that "Comparative prices" is significant in Table 5 corresponding to the row on the same criterion. This means that when all the websites that registered a rating equal to and below median in terms of this criterion are considered in the regression, this criterion is significant in explaining customer loyalty. Similarly, this criterion is significant in Table 6 also corre-

Table 5 Results of regressions for low performance (equal to and below median) of each of the performance criteria (Dependent variable: Customer Loyalty)

Low Performance in terms of ↓	Regression coefficients										Other regression results				
	Intercept	Management accessibility	Payment process	Privacy experience	Comparative prices	Satisfaction with claims	On-time delivery	Customer support	Refunds/ returns	Industry	R^2	R^2 adj.	F	Sample size	Max VIF
Management accessibility	0.278***	0.041	0.152***	0.016	0.079**	0.333***	0.019**	0.054	0.018	0.0003	0.605	0.589	39***	242	3.135
Payment process	0.289***	0.127***	−0.063	−0.01	0.16***	0.447***	0.025***	−0.004	0.022	0.0001	0.620	0.606	42***	240	3.487
Privacy experience	0.336***	0.07137*	0.11**	−0.011	0.042	0.37***	0.0214***	0.038	0.010	0.0001	0.603	0.587	39***	242	3.507
Comparative prices	0.276***	0.069	0.057	−0.022	0.06*	0.408***	0.033***	0.089***	0.021*	0.0003	0.762	0.753	83***	242	4.094
Satisfaction with claims	0.263***	0.073*	0.123**	0.033	0.102***	0.343***	0.02***	0.015	0.021*	0.0001	0.599	0.584	39***	245	3.229
On-time delivery	0.302***	0.121***	0.094**	0.059*	0.035	0.288***	0.02***	0.046	0.027**	0.00001	0.691	0.679	58***	242	3.550
Customer support	0.28***	0.117***	0.165***	0.0001	0.078**	0.311***	0.02***	−0.004	0.025*	0.0001	0.598	0.583	39***	244	2.495
Refunds/ returns	0.213***	0.132***	0.112***	0.046	0.012	0.428***	0.03***	0.003	0.02*	−0.00004	0.753	0.744	82***	252	2.773

***$p < 0.01$, **$p < 0.05$, *$p < 0.10$

Table 6 Results of regressions for high performance (above median) of each of the performance criteria (Dependent variable: Customer Loyalty)

High Performance in terms of ↓	Regression coefficients										Other regression results				
	Intercept	Management accessibility	Payment process	Privacy experience	Comparative prices	Satisfaction with claims	On-time delivery	Customer support	Refunds/ returns	Industry	R^2	R^2 adj.	F	Sample size	Max VIF
Management accessibility	0.268***	0.16*	−0.005	0.04	0.107***	0.388***	0.027*	−0.005	0.019	0.0001	0.511	0.491	27***	242	3.006
Payment process	0.143**	0.158***	0.262***	0.05	0.03	0.326***	0.013	0.006	0.011	0.0003*	0.563	0.546	33***	244	1.854
Privacy experience	0.19***	0.194***	0.074	0.063*	0.073	0.329***	0.04**	0.001	0.033**	0.0003	0.641	0.627	46***	242	2.130
Comparative prices	0.206***	0.135***	0.209***	0.037	0.124***	0.3***	−0.01	−0.002	0.001	0.0001	0.684	0.672	56***	242	3.700
Satisfaction with claims	0.205***	0.282***	0.084	−0.002	0.045	0.333***	0.037***	0.003	0.009	0.0004*	0.515	0.496	27***	239	2.590
On-time delivery	0.144*	0.099**	0.103	−0.014	0.178***	0.465***	0.046	0.001	−0.023	0.0003	0.629	0.614	44***	242	3.179
Customer support	0.217***	0.071	−0.021	0.068*	0.116***	0.414***	0.027**	0.119	−0.014	0.0003	0.572	0.555	34***	240	2.561
Refunds/ returns	0.46***	0.096*	0.052	−0.007	0.256***	0.328***	0.014	0.024	−0.227*	0.0003	0.698	0.686	57***	232	4.940

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 7 Classification of e-commerce performance criteria

	Critical	Desirable	Satisfier	Dissatisfier	Neutral
Management accessibility			×		
Payment process			×		
Privacy experience			×		
Comparative prices		×			
Satisfaction with claims	×				
On-time delivery				×	
Customer support					×
Refunds/returns		×			

sponding to the row on the same criterion. Thus, "Comparative prices" can be classified as a desirable criterion. Looking at Tables 5 and 6, we find that "Refunds/returns" is also a desirable criterion. The criterion "Satisfaction with claims" also meets this requirement but "Satisfaction with claims" has already been designated as a critical criterion. Thus a critical criterion is also a desirable one but not vice versa. We hence classify "Comparative prices" and "Refunds/returns" as desirable criteria.

To be classified as a satisfier, the regression with high performance in terms of the criterion should show that criterion as significant but the regression with low performance should show the criterion as insignificant. Thus a satisfier is interpreted as the criterion where a high performance in terms of the criterion significantly improves customer loyalty but a low performance does not significantly reduce customer loyalty. Looking at Tables 5 and 6, we find that three criteria, namely "Management accessibility", "Payment process" and "Privacy experience" meet this requirement and hence we classify these criteria as satisfiers.

To be classified as a dissatisfier, the regression with high performance in terms of the criterion should show that criterion as insignificant but the regression with low performance should show the criterion as significant. Looking at Tables 5 and 6, we find that "On-time delivery" meets this requirement and hence we classify this criterion as a dissatisfier.

The only other criterion "Customer support" is insignificant at the corresponding regressions for low and high performances. Hence, it is a neutral criterion.

Our classification of the criteria is shown in Table 7. Thus, there is one critical criterion ("Satisfaction with claims"), two desirable criteria ("Comparative prices" and "Refunds/returns"), three satisfier criteria ("Management accessibility", "Payment process" and "Privacy experience"), one dissatisfier criterion ("On-time delivery") and one neutral criterion ("Customer support").

3.2.1 Rules that could be used as guidelines in making the classifications

On the basis of the analysis presented in this section, a set of logical rules can be developed to classify criteria. These are given below.

- A critical criterion should satisfy either or both of the following: (a) It should find no criterion to be significant for the regression with low performance of this criterion, and/or (b) It should always be significant in all regressions.

- A desirable criterion should be significant both for high performance and low performance in terms of the criterion. Thus a critical criterion is a desirable criterion but the reverse is not true.
- A satisfier criterion should be significant for high performance but not significant for low performance in terms of the criterion.
- A dissatisfier criterion should be insignificant for high performance but significant for low performance in terms of the criterion.
- A neutral criterion will not be significant for the regressions for high and low performance in terms of the criterion.

4 Discussion

We believe that the results presented in the previous section can provide meaningful information for managers of e-commerce websites.

The most striking feature of our analysis presented in Tables 5 and 6 is that "Satisfaction with claims" is rated as the critical e-commerce performance criterion. This means any unsatisfactory performance in terms of this criterion cannot be compensated by better performance in terms of one or more other criteria. This criterion comprises the satisfaction of customers who received right product that matches the product claims made in the website. This criterion is closely related to the criterion "product met expectations" in bizrate but there are no studies that used this criterion separately when analyzing bizrate data to empirically capture impact on customer loyalty. Jiang and Rosenbloom [11] considered product met expectations along with three more criteria on "after-delivery satisfaction" when they attempted to develop a structural equation model. They did find strong relationship between "after-delivery satisfaction" and customer loyalty, but the relationship is based on the combined effect of "product met expectations" and three other related criteria. Product information, another criterion used by bizrate is somewhat related to satisfaction with claims and has been used in many studies. This product information has been recognized by Heim and Sinha [8] as one of the most important determinant of customer loyalty The higher importance levels associated with "satisfaction with claims" reinforces the universal view that correct product information and unexaggerated claims about product performance will lead to customer loyalty.

However, performance in terms of "satisfaction with claims" is not directly under the control of a manager of an e-commerce website. Obviously, product descriptions are prepared by producers, and an e-commerce retailer simply publishes the information from producers. If customers find that the characteristics of the product they received do not match with product description, it is important to assess the source of discrepancy. It may be that product description is wrong, or the website published description of a wrong or obsolete product.

It should be noted that, unlike some other criteria such as "on-time delivery" that deals with a relatively straight-forward performance, "satisfaction with claims" deals with performance over many aspects of e-tailing. For a customer to be satisfied in terms of this criterion, (1) product descriptions from products need to be accurate, (2) the descriptions must be accurately published in the e-tailer's website, (3) order

processing should be accurate in picking and dispatching the correct product, and (4) delivery must be error-free without any alterations/damages to the product. Thus a good performance in terms of this criterion requires good performance in terms of several echelons of the e-tailing supply chain.

Our study has found that "Comparative prices" and "Refunds/returns" are desirable criteria in the e-commerce context. Thus, price perception by customers could significantly alter customer loyalty in either way—the perception of a low price could improve customer loyalty while the perception of a high price could move customers away from the website. This finding agrees with that of Jiang and Rosenbloom [10]. Similarly, if customers perceive good service from a website in handling their returns, they will patronize the website better. But if they perceive the handling of returns as bad, then they may prefer competitors. Our finding is generally consistent with those of some previous studies [3, 7, 8, 21].

"Management accessibility", "Payment process" and "Privacy experience" are satisfiers. Thus a high performance in terms of these criteria will be positively noticed by customers but a poor performance may not be very negatively noticed. Thus customers that can contact the management team feel happy about the website and happy to purchase at the website. This can be achieved by designing websites efficiently with adequate FAQs, providing 24/7 email and/or telephone access, and if possible introducing a chatting service. A secured payment process with good privacy is also viewed favorably by customers. There is thus incentive for website managers to perform well in terms of these three criteria. Our findings are consistent with those of Odom et al. [20] and Turner and Callaghan [26].

"On-time delivery" is considered as a dissatisfier as per our results. Thus a poor delivery and logistics performance could be viewed quite unfavorably by e-commerce customers. This points to the need to maintain average and good standards in terms of logistic performance. This finding is consistent with similar studies in e-logistics that found websites that use established couriers for delivery are perceived well by customers [4, 7].

5 Summary and conclusions

Our study contributes to the e-commerce literature by providing the perspectives of satisfier, dissatisfier, etc. in the e-commerce context for the first time. We have used the regression based approach of Hartline et al. [6] to classify e-commerce service criteria in terms of their significance towards customers' intention to shop from the website again. Using data from an online rating site on 484 e-commerce websites, we have found that "satisfaction with claims" is the single most important criterion valued as critical by online customers. "Comparative prices" and "Refunds/returns" are desirable criteria, "Management accessibility", "Payment process" and "Privacy experience" are satisfiers while "On-time delivery" is a dissatisfier.

We can use the results of this paper to help owners/managers of e-commerce websites in deciding the criteria they need to emphasize when designing their website. Our findings generally point to the need for providing great emphasis on including accurate, timely and relevant information on its products. Pricing of products and

ability to handle returns are important as a good performance can boost customer loyalty but a bad performance could move customers away. Good website design that instills a sense of privacy in the minds of the customer, and security of payments will alter customers' perceptions in favor of the website, but a poor logistics performance will be viewed negatively.

Appendix: Some experiences of dealing with multicollinearity

We would like to highlight our experiences with multicollinearity here. This study initially started with 538 websites but some of the variable inflation factors pertaining to the regressions reported in Table 5 and Table 6 were above 5. Since we preferred a threshold of 5, we looked into alternatives to reduce the impact of multicollinearity. Some ways to deal with multicollinearity are generally suggested in the literature [5, 15, 19]. These include deleting one or more independent variables or transforming some independent variables. However, they could not be used in our study because of the limited number of independent variables and because of our need to classify them as critical criteria, desirable criteria, etc. Biased estimation procedures such as ridge regression or principal component regression are also suggested in the literature [19]. Ridge regression involves specifying the ridge trace [9, 19] which is a subjective procedure. Also, some of the desirable statistical properties of OLS regression are compromised in ridge regression [19]. Hence we did not prefer ridge regression here. Principal component regression involves identifying orthogonal factors of the independent variables, and performing the regression with the factors instead of the independent variables [19]. Since the independent variables are important in our study, we could not use principal component regression either.

However, we had a useful observation on the possible sources of multicollinearity in our dataset. We observed that regressions involving high performances did not show any evidence of serious multicollinearity issues (with VIF values below 5), but regressions involving low performances showed issues with multicollinearity (with much higher VIF values). This prompted us to study the low performance data in more detail. We finally found that the bottom 10% of the data (sorted using customer loyalty ratings) were responsible for much of the multicollinearity issues. This might be due to the fact that the customers that are not satisfied with a given website and not interested in shopping with it again were not serious to rate performances of the website with adequate care. In fact, when we removed the bottom 10% of the data and re-ran the entire exercise again (with new median splits), we obtained remarkable improvements in the VIF values (as reported in Tables 5 and 6). The discussion in this paper is based on the reduced data set, after removing the bottom 10% of the data.

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