Original Article

The strategic analysis of online customers' repeat purchase intentions

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ABSTRACT Measuring indirect importance of various attributes is a very common task in marketing analysis for which researchers use correlation and regression techniques. We have listed and illustrated some common problems with widely used latent importance measures. A more theoretically sound approach – the Shapley Value decomposition – was applied to a rich data set of US internet stores. The use of store-level data instead of respondent-level data allowed us to reveal the factors, which are powerful in explaining, why some stores have higher rates of willingness to make repeat purchases than the others. By confronting the indirect importance and performance measures for three different internet stores, we have revealed strengths, weaknesses, attributes that the company should bring customers' attention to and attributes that do not require immediate improvement.

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INTRODUCTION

Nowadays, internet forums and special web services give customers an opportunity to express their opinion about the quality of goods and services sold online. The data containing information on satisfaction with various attributes of internet stores are very valuable for researchers and marketers.^{1,2} E-tailers gradually realize that

they can reduce costs by increasing loyalty, because it is cheaper to retain existing customers than to attract new ones. Therefore, revealing which attributes have a stronger influence on loyalty and satisfaction of internet shoppers can help e-tailers to become more competitive by concentrating on the most important areas.

Researchers studied the determinants of customer loyalty and satisfaction in various markets.^{3–5} Unlike traditional retailing, e-commerce only starts to attract the attention of researchers.^{6–10} Marketing scholars try to

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determine the characteristics that influence customer satisfaction and loyalty,^{11,12} as well as characteristics, influencing the effectiveness of marketing activity and internet stores' success.^{13,14} Compared with offline stores, internet stores offer more opportunities for interactive and personalized marketing.¹⁵ It is easier for online buyers to compare alternatives, especially in the case of functional products and services. The fact that operations are available at the click of the mouse raises concerns about customer loyalty: if customers can easily compare their purchasing opportunities, they may be satisfied with the service, but may easily switch between stores in search of a cheaper store.

Satisfaction and loyalty measures are not perfect substitutes:^{16,17} a consumer can be loyal without being fully satisfied (for example, in the case of few alternative stores) or she can be satisfied, but not loyal (for example, in the case of a large number of alternatives). In our study, we adhere to the definition of loyalty given by Srinivasan *et al*,¹⁸ according to which customer loyalty of a particular online store is expressed in their willingness to make repeat purchases.

Most customer satisfaction and loyalty studies analyze a single company, using proprietary survey data. Instead, we gather publicly available data on a sample of internet stores, which give us an opportunity to answer the following questions:

1. *Why some internet stores are more successful than the others in terms of repeat purchase intentions, that is, which attributes have the highest indirect importance for online shoppers?*

Fontenot *et al*¹⁹ argue that the declared importance (stated by respondents directly) gives a weaker differentiation of attribute importance than indirect importance, obtained by quantifying the influence of attribute ratings on some overall satisfaction or loyalty measure. If a researcher comes to the conclusion that attributes have almost indistinguishable importance for respondents, such a result has little practical value and is probably caused by the deficiencies of the approach to measuring importance. In this article, we give details of the Shapley Value

approach to measuring indirect attribute importance. This method is said to be used by some market research companies and in the field of labor economics, but has not been widely used in academic marketing papers.

1. *How can an internet store combine data on its performance for every attribute and the importance of an attribute to conduct 'performance-importance' strategic quadrant-analysis of its customers' satisfaction?*

DATA DESCRIPTION

The data were collected in September 2010 from www.Bizrate.com. The data set consists of average grades given by customers to 804 non-food internet stores. All grades are on a 10-point scale with 10 being excellent. We use a relatively strict requirement for the sample size, based on which the average grade is calculated – no less than 250 respondents during the last 3 months. This ensures that the average grade reflects the opinion of a reasonable number of people, not just a handful of customers.

A descriptive analysis of the sample is presented in Table 1. The coefficient of variation (the ratio of the standard deviation to the mean, multiplied by 100) indicates that grades for all attributes are rather homogeneous. Shipping charges ratings are the least homogeneous (the coefficient of variation is 11.4 per cent). It is worth mentioning that 'Overall rating' and 'Would shop here again' have very similar distribution and they are strongly correlated (Pearson correlation coefficient = 0.937). That is why further we use only 'Would shop here again' as the dependent variable.

Before conducting the multivariate analysis, we did z-standardization of all attribute ratings (as a result, all the variables have mean = 0 and standard deviation = 1): $Z_{ij} = ((R_{ij} - \bar{R}_j) / s_j)$, where R_{ij} – store i rating on attribute j , $\bar{R}_j$ – average rating of all stores on attribute j , s_j – standard deviation of attribute j rating.

MEASURING INDIRECT IMPORTANCE

It is useful to measure the importance of every attribute, that is, the strength of its influence on some overall measure of store performance,

Table 1: Descriptive statistics

	Mean	Median	Percentile 25	Percentile 75	SD	Minimum	Maximum	Coeff. of variation (%)
Would shop here again	8.8	8.9	8.6	9.1	0.5	6.2	10.0	5.7
Overall rating	8.8	8.9	8.6	9.1	0.5	6.0	9.9	5.7
Ease of finding what you are looking for	8.7	8.7	8.6	8.9	0.3	7.7	9.8	3.4
Selection of products	8.7	8.8	8.6	8.9	0.3	7.6	9.9	3.4
Clarity of product information	8.7	8.7	8.6	8.9	0.3	7.4	9.9	3.4
Prices relative to other online merchants	8.4	8.4	8.2	8.7	0.4	6.9	9.7	4.8
Overall look and design of site	8.5	8.6	8.4	8.7	0.3	7.0	9.9	3.5
Shipping charges	7.9	8.0	7.3	8.6	0.9	4.9	9.9	11.4
Variety of shipping options	8.4	8.4	8.1	8.6	0.4	5.7	9.9	4.8
Charges stated clearly before order submission	9.0	9.0	8.8	9.2	0.3	7.2	9.9	3.3
Availability of product you wanted	8.9	9.0	8.7	9.3	0.5	5.8	10.0	5.6
Order tracking	8.8	8.9	8.6	9.2	0.6	5.8	10.0	6.8
On-time delivery	8.9	9.1	8.7	9.3	0.5	6.3	9.9	5.6
Product met expectations	8.9	9.0	8.7	9.2	0.5	6.7	9.9	5.6
Customer support	8.6	8.7	8.3	9.0	0.6	5.3	9.9	7.0

such as the overall satisfaction or the loyalty. There are a number of widely used methods, such as correlation and regression analysis, which provide researchers with some coefficients.

Some of the problems with correlation and regression coefficients are:

- There are no serious theoretical grounds to consider them to be the measures of importance.
- They do not add up to 100 per cent, that is, you cannot decompose the overall satisfaction into the effects of every attribute.
- Very often these coefficients are very similar for several attributes, which leads to low diagnostic power of these measures of indirect importance.

Instead of these widespread approaches, we use the Shapley Value approach to the decomposition of R^2 (the coefficient of determination) in a regression of repeat purchase intention on attribute ratings. In cooperative game theory, the Shapley Value allows dividing the payoff among players so that the Nash equilibrium is achieved.²⁰ In a regression, explanatory variables correspond to players and the coefficient of determination – to the total payoff of the coalition consisting of all the players.²¹ The Shapley Value for a particular attribute equals to the average gain in R^2 , which is observed when this variable is included in the

model, across all possible sequences of independent variables inclusion into the model. Therefore the Shapley Value approach is theoretically sound. In addition, the sum of Shapley Values for all attributes equals R^2 . That is why this approach is appropriate for the decomposition of R^2 into components.

We start with ordinary least squares (OLS) regression with robust standard errors to obtain standardized regression coefficients (Table 2).

The model explains almost 79 per cent of the dependent variable's variance. Most standardized regression coefficients are close to each other and insignificantly different from zero, which makes it difficult to evaluate the contribution of each attribute to customer loyalty. One more problem is that coefficients at 4 of 13 variables are negative (however, they are insignificantly different from zero). This is probably caused by multicollinearity problem, not by the fact that these factors really have negative or zero influence on customer loyalty. Researchers often have to recode such negative coefficients to zero if they want to estimate the percentage contribution of each attribute to R^2 , which is a questionable approach. That is why we calculate the percentage contributions of each attribute to R^2 using the Shapley Value decomposition,²² comparing it with a more common measure – Pearson correlation (Table 3).

Table 2: Standardized regression coefficients

<i>Would shop here again</i>	<i>OLS with White standard errors</i>
Ease of finding what you are looking for	-0.040 (0.047)
Selection of products	0.033 (0.033)
Clarity of product information	0.037 (0.039)
Prices relative to other online merchants	-0.002 (0.026)
Overall look and design of site	0.045 (0.040)
Shipping charges	-0.015 (0.031)
Variety of shipping options	0.030 (0.032)
Charges stated clearly before order submission	0.025 (0.040)
Availability of product you wanted	-0.043 (0.047)
Order tracking	0.060 (0.048)
On-time delivery	0.271*** (0.058)
Product met expectations	0.351*** (0.032)
Customer support	0.307*** (0.044)
Constant	0.000 (0.016)
Observations	804
R^2	0.788

Standard errors in parentheses.

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

The coefficient of variation based on all percentage contributions and the coefficient of variation based on percentage contribution of the five most important attributes clearly indicate that the Shapley Value approach has a higher diagnostic power, that is, it distinguishes better between important and unimportant attributes.

It should be noted that the availability of the product you wanted contributes 11.5 per cent to R^2 , whereas according to the ordinary regression it was one of the least significant factors. This difference supports the idea that care should be taken when interpreting standardized regression coefficients as importance measures.

STORES SEGMENTATION

Before applying cluster analysis, we conduct principal components analysis with varimax rotation so as to be able to segment stores based on several meaningful aspects of internet shopping. Only standardized input variables (that is, all variables except 'Overall rating' and 'Would shop here again') were included in the analysis.

According to the rule of thumb (include factors for which eigenvalues exceed 1), three factors were extracted. The first three factors explain over 77 per cent of the total variance

Table 3: Attribute importance based on Pearson correlations and Shapley Values

<i>Attribute</i>	<i>Pearson correlation</i>		<i>Contribution to R^2 based on the Shapley Value approach (%)</i>
	<i>Raw</i>	<i>Normalized (%)</i>	
Ease of finding what you are looking for	0.339	5.307	1.617
Selection of products	0.336	5.254	1.662
Clarity of product information	0.438	6.860	3.416
Prices relative to other online merchants	0.204	3.198	0.551
Overall look and design of site	0.339	5.300	1.864
Shipping charges	0.203	3.169	0.606
Variety of shipping options	0.361	5.653	2.038
Charges stated clearly before order submission	0.375	5.873	2.248
Availability of product you wanted	0.700	10.957	11.502
Order tracking	0.741	11.590	14.269
On-time delivery	0.788	12.331	18.339
Product met expectations	0.764	11.954	20.859
Customer support	0.802	12.553	21.029
<i>Coefficient of variation based on all percentage contributions</i>	46.771		106.851
<i>Coefficient of variation based on percentage contributions of five most important attributes</i>	5.322		24.391

Table 4: Rotated component matrix

	Component			Interpretation
	1	2	3	
On-time delivery	0.915	0.144	0.078	Post-order service and satisfaction with claims
Order tracking	0.883	0.180	0.050	
Customer support	0.855	0.182	0.109	
Availability of product you wanted	0.833	0.168	0.221	
Product met expectations	0.771	0.120	0.203	
Ease of finding what you are looking for	0.158	0.892	0.199	Internet store usability and design
Overall look and design of site	0.164	0.889	0.027	
Clarity of product information	0.253	0.865	0.193	
Selection of products	0.140	0.798	0.291	
Shipping charges	0.068	0.054	0.871	Economic considerations (price, cost and speed of delivery)
Charges stated clearly before order submission	0.221	0.277	0.816	
Variety of shipping options	0.218	0.248	0.803	
Prices relative to other online merchants	0.074	0.106	0.756	

Note: Bold values correspond to the highest factor loadings (>0.75) within each of the components.

(29.9 per cent, 25.0 per cent and 22.4 per cent, correspondingly). The correlations between the initial variables and the factor scores, as well as the interpretation of the principal components, are presented in Table 4.

The generated factor scores can be used in regression analysis to evaluate the influence of each factor on the overall satisfaction and the repeat purchase intention, but we will use them in cluster analysis to identify groups of stores with similar strengths and weaknesses.

To reveal several groups of stores based on their strengths and weaknesses, we conducted hierarchical cluster analysis based on the factors that were previously extracted using principal component analysis. As cluster analysis is an exploratory technique, we compared several methods and decided that the best solution is the three-cluster solution obtained using the centroid method, which gave segments that differ significantly with respect to mean factor scores (Table 5).

- *Cluster 1* consists of internet stores with the highest ratings for 'Economic considerations', relatively high ratings for 'Internet store usability and design' and low scores for 'Post-order service and satisfaction with claim'.

Table 5: Mean factor scores within clusters

	Cluster		
	1 (A)	2 (B)	3 (C)
	Mean	Mean	Mean
Post-order service and satisfaction with claims	−0.870	−0.062A	0.527AB
Internet store usability and design	0.111C	0.765AC	−0.664
Economic considerations	0.741BC	−0.631	0.090B
Count	189	271	344
Proportion (%)	23.5	33.7	42.8

Results are based on two-sided tests assuming equal variances with significance level 0.05. For each significant pair, the key of the smaller category appears under the category with larger mean. Tests are adjusted for all pair-wise comparisons within a row of each innermost sub-table using the Bonferroni correction.

- *Cluster 2* consists of internet stores with the highest ratings for 'Internet store usability and design', average ratings for 'Post-order service and satisfaction with claims' and the lowest ratings for 'Economic considerations'.
- *Cluster 3* consists of internet stores with the highest ratings for 'Post-order service and satisfaction with claims', average ratings for 'Economic considerations' and the lowest ratings for 'Internet store usability and design'.

Cluster analysis has shown that the stores' strengths and weaknesses differ. Some stores have high website usability and offer good prices and other charges, but relatively low post-order service, despite the fact that post-order services contributes the most to customer loyalty.

STRATEGIC QUADRANT-ANALYSIS

In order to reveal strengths and weaknesses of a store and to give recommendations on high-priority improvements, we drew a chart, where one axis represents attribute importance and the other – attribute performance. The chart is divided into four quadrants with two lines corresponding to the mean values of importance and performance (Figure 1).

In our study, attribute performance is measured as the mean 'Would shop here again' rating and importance – as the percentage contribution to R^2 is based on the Shapley Value approach.

The interpretation of each quadrant is as follows:

- Important attributes ('high importance – high performance') are attributes, which are a company's assets, which should be maintained at a high level.
- Desired attributes ('high importance – low performance') are attributes that should be improved first.
- Expected attributes ('low importance – high performance') are attributes, which are a company's assets, but are perceived as those which go without saying.
- Unimportant attributes ('low importance – low performance')

Figure 1: The concept of strategic quadrant analysis.

performance') are attributes, the improvement of which is not of high priority, despite relatively low marks.

We will illustrate the use of strategic quadrant analysis for the assessment of several stores, representing the three segments, previously extracted using cluster analysis. The mean factor scores of each cluster (that is, cluster centers) were given in Table 5. In order to find stores typical of each cluster, we calculated the Euclidian distances from each store i to the cluster centers using the following formulas:

$$dist_{i1} = \sqrt{(fac_{i1} - (-0.869520))^2 + (fac_{i2} - 0.111454)^2 + (fac_{i3} - 0.741034)^2}$$

$$dist_{i2} = \sqrt{(fac_{i1} - (-0.062070))^2 + (fac_{i2} - 0.765277)^2 + (fac_{i3} - (-0.630650))^2}$$

$$dist_{i3} = \sqrt{(fac_{i1} - 0.526626)^2 + (fac_{i2} - (-0.664110))^2 + (fac_{i3} - 0.089679)^2}$$

where $dist_{i1}$ – the distance from the observation i to the center of cluster 1; $dist_{i2}$ – the distance from the observation i to the center of cluster 2; $dist_{i3}$ – the distance from the observation i to the center of cluster 3; fac_{i1} – factor 1 ('Post-order service and satisfaction with claims') score for the observation i ; fac_{i2} – factor 2 ('Internet store usability and design') score for the observation i ; and fac_{i3} – factor 3 ('Economic considerations') score for the observation i .

Then we have chosen three stores, which are closest to each cluster center, so that each store represents one cluster, and drew strategic quadrant analysis charts for each of these internet stores. The strategic quadrant analysis maps for each store are presented in Figures 2, 3 and 4, respectively.

The summary of quadrant analysis is presented in Table 6. Such attributes as 'On-time delivery', 'Availability of product you wanted' are important, whereas such attributes as 'Variety of shipping options' and 'Shipping charges' are unimportant for all stores. 'Charges stated clearly before order submission' always belongs to the group of expected attributes.

Figure 2: Importance-performance analysis for 'eForCity'.

Figure 3: Importance-performance analysis for 'Baseball Express'.

Figure 4: Importance-performance analysis for 'CAMPMOR'.

Table 6: Quadrant-analysis summary

<i>Attribute type</i>	<i>Segment 1: eForCity</i>	<i>Segment 2: Baseball express</i>	<i>Segment 3: CAMPMOR</i>
Important	<ul style="list-style-type: none"> • Availability of product you wanted • On-time delivery 	<ul style="list-style-type: none"> • Product met expectations • On-time delivery • Customer support • Availability of product you wanted 	<ul style="list-style-type: none"> • Product met expectations • On-time delivery • Order tracking • Availability of product you wanted
Desired	<ul style="list-style-type: none"> • Product met expectations • Customer support • Order tracking 	<ul style="list-style-type: none"> • Order tracking 	<ul style="list-style-type: none"> • Customer support
Expected	<ul style="list-style-type: none"> • Charges stated clearly before order submission • Ease of finding what you are looking for • Prices relative to other online merchants • Clarity of product information • Selection of products • Overall look and design of site 	<ul style="list-style-type: none"> • Clarity of product information • Charges stated clearly before order submission • Selection of products • Ease of finding what you are looking for • Overall look and design of site 	<ul style="list-style-type: none"> • Charges stated clearly before order submission
Unimportant	<ul style="list-style-type: none"> • Variety of shipping options • Shipping charges 	<ul style="list-style-type: none"> • Prices relative to other online merchants • Variety of shipping options • Shipping charges 	<ul style="list-style-type: none"> • Ease of finding what you are looking for • Selection of products • Prices relative to other online merchants • Clarity of product information • Overall look and design of site • Variety of shipping options • Shipping charges

CONCLUSION

We have listed and illustrated some common problems with correlation and regression coefficients, which are widely used as indirect importance measures in marketing analysis. Unlike them, the Shapley Value approach, which came to econometrics from game theory, is a theoretically sound method for calculating the individual contribution of service attributes to customer loyalty. This method was applied to a large sample of US internet stores. The use of store-level data instead of respondent-level data allowed us to explain why some stores have higher rates of willingness to make repeat purchases than the others.

According to Shapley Value coefficients of importance, the most important attributes (with percentage contribution exceeding 10 per cent) are clearly ‘*Customer support*’, ‘*Product met expectations*’, ‘*On-time delivery*’, ‘*Order tracking*’ and ‘*Availability of product you wanted*’.

It is important to highlight how a firm can use the information about the latent importance

of various attributes. By confronting it with performance measures (such as loyalty or satisfaction), companies can reveal their strengths (high importance – high performance), weaknesses (high importance – low performance), attributes that the company should bring customers’ attention to (low importance – high performance) and attributes, which do not require immediate improvement (low importance – low performance).

We have conducted factor analysis on store attributes ratings followed by cluster analysis. As a result, three segments were formed, which have different strong points: segment 1 has good Post-order service and satisfaction with claims, segment 2 has the best internet store usability and design, and segment 3 consists of stores that are good from an economic point of view. Then, we illustrated the usefulness of strategic quadrant analysis by conducting it for three companies that represent three different segments of stores.

It is worth mentioning that our study is limited to modeling repeat purchase intention.

Perhaps that is the reason why economic considerations appeared to be not very important: customers evaluate the prices, shipping charges and the variety of shipping options beforehand and rarely regret buying at some particular store. Therefore, in order to retain the existing customers, internet retailers do not have to worry a lot about prices and charges, but the 'economic considerations' factor can be important for attracting new customers. Learning the ways to increase the probability of initial purchase is one of the possible issues for further research.

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- 22 The Shapley Value has not become a standard procedure in most statistical packages yet. We use Stata module shapley developed by Stanislav Kolenikov. This program performs exact additive decomposition of a sample statistic (in our case – R²) by effects specified in the factor list. To perform the Shapley decomposition, the effects are eliminated one by one, and marginal effects from each exclusion are weighted in such a way that all exclusion trajectories have equal weights.