The Structural Model of E-service Quality, E-customer Satisfaction, Trust, Customer Perceived Value and E-loyalty

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Abstract: The aim of this research is to evaluate causal linkages among e-service quality, e-customer satisfaction, trust, customer perceived value and e-loyalty and present a structural model. DEMATEL technique is applied to determine the causal effects of these dimensions on each other. In order to conduct DEMATEL analysis, 30 experts are asked about the causal relationships among these dimensions in e-retailing companies in Iran and analysis is conducted based on their opinions. The results indicate e-loyalty is the most significant variable in online retailing which receives the most influences from other variables. Also, the results reveal that privacy, fulfillment and Efficiency are the most effective dimensions in the e-retailing system.

Key words: DEMATEL modeling technique, e-service quality, e-customer satisfaction, trust, customer perceived value, and e-loyalty.

INTRODUCTION

With the increase of internet application by non-professional users in Iran, many retailing companies tend to sell their goods or services online instead of the traditional ways. An online selling system can make opportunity for the organization to introduce its goods and services, advertise its new items, sell easily and quickly, and receive money online. Also, the company reaches customers in remote places and this can extend the area of its business. Besides, customers increasingly prefer to purchase many items online. This has many benefits for them versus the traditional purchasing ways. For instance, instead of traveling a long distance to buy something, they may enjoy not only a free delivery, but also online purchasing discount by using an e-shopping system.

Due to these changes, e-retailing companies are trying to find loyal customers to ensure their survival. Customers' loyalty is considered important because of its positive effect on long-term profitability (Ribbink and *et al*, 2004).

Several authors indicated that e-loyalty is subsequent of interactions of e-service quality, e-customer satisfaction, trust and perceived customer value.

Previous studies identified several dimensions as criteria of e-service quality. It was empirically approved by several studies that if an online system have better status in e-service quality dimensions, its customers are more satisfied and this will lead to more trust. Also, it has been frequently tested that satisfaction and trust of customers beside the customer perceived value influence e-loyalty. Four dimensions including Privacy, Fulfillment, System Availability and Efficiency are identified as the criteria of e-service quality.

The aim of this study is to present a framework to study interrelationships among dimensions of the e-retailing system. In other words, this research tries to reach below objectives:

1. To identify factors which are influencing e-loyalty in e-retailing systems;
2. To construct a framework which explains e-loyalty as subsequent of these influential factors;
3. To evaluate effects among understudy variables using experts' opinions by applying DEMATEL technique.
   To obtain mentioned objectives consequent steps are followed.

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Firstly, to construct this framework the dimensions of online retailing system which influence loyalty of customers and linkages among them are identified through review on the literature.

Secondly, the assumed relationships within the model are posed as research hypotheses and analyzed by DEMATEL method.

MATERIALS AND METHODS

2. 1. Literature Review:

Recently several researches have studied variables influencing loyalty of customers in e-business area and tried to present, explain and evaluate linkages among these variables.

Chang and *et al*. (2009) aimed to construct a model to represent linkages between e-service quality, customer satisfaction, and customer loyalty. Also, they assumed a moderate role for customer perceived value between customer satisfaction and loyalty. Data were collected by means of a questionnaire survey from customers of an online website. The results of statistical analysis indicate e-service quality positively affects customer satisfaction which leads to loyalty. Also, the results revealed customers with higher perceived value have higher degree of loyalty.

Kuenzel (2009) reviewed the effect of customer satisfaction on loyalty. They concluded customer satisfaction positively influences loyalty.

Terblanche and Boshoff (2010) aimed to examine interrelationship between customer satisfaction and loyalty in fast food sector in South Africa. The results showed that loyalty is positively affected by customer satisfaction.

Wenying and Sun (2010) aimed to examine relationships among e-service quality, e-customer satisfaction, perceived value and loyalty empirically. Data were collected from online customers and structural equation modeling was applied to test the relationships. The results revealed that e-service quality positively influences customer satisfaction, perceived value and e-loyalty. Also, findings showed both e-customer satisfaction and perceived value directly affect e-loyalty.

Sun and *et al*. (2009) identified Privacy, Fulfillment, System availability and Efficiency as the variables of e-service quality. They aimed to examine causal linkages among dimensions of e-service quality, customer satisfaction, perceived value and loyalty. The results showed that dimensions of e-service quality affect customer satisfaction and perceived value. Also, results indicated that e-customer satisfaction and perceived value influence loyalty.

Supportively, Sahadev and Purani (2008) identified Privacy, Fulfillment, System availability and Efficiency as the variables of e-service quality. They examined relationships among dimensions of e-service quality, customer satisfaction, trust and loyalty. The results indicated dimensions of e-service quality positively affect both customer satisfaction and trust. Also, results revealed customer satisfaction and trust directly affect loyalty. Semeijn and *et al*. (2005) examined the relationships between e-customer satisfaction and loyalty. Results indicated the positive effect of e-customer satisfaction on loyalty.

Yen and Lu (2008) identified some variables such as efficiency, system availability, privacy and fulfillment as the dimensions of e-service quality. Then they examined the linkages among dimensions of e-service quality, customer satisfaction and loyalty. Results revealed the dimensions of e-service quality directly influence customer satisfaction. Subsequently, customer satisfaction positively affected loyalty.

Kassim and Abdullah (2010) examined the relationships among e-service quality dimensions, customer satisfaction and trust. The results indicated direct effect of service quality on customer satisfaction. Further, the results showed customer satisfaction positively influence e-trust.

Collier and Bienstock (2009) identified privacy as one of the dimensions of e-service quality. They concluded privacy positively influences customer satisfaction.

Based on the literature, 12 hypotheses are assumed among e-service quality, e-customer satisfaction, trust, customer perceived value and e-loyalty which are listed below:

H1: Privacy directly influences E-Customer Satisfaction (Collier and Bienstock, 2009; Chang and *et al*. 2009; Sun and *et al*. 2009; Sahadev and Purani, 2008; Yen and Lu, 2008)

H2: Privacy directly influences Trust (Sahadev and Purani, 2008)

H3: Fulfillment directly influences E-Customer Satisfaction (Sun and *et al*, 2009; Sahadev and Purani, 2008; Yen and Lu, 2008)

H4: Fulfillment directly influences Trust (Sahadev and Purani, 2008)

H5: System Availability directly influences E-Customer Satisfaction (Sun and *et al*, 2009; Sahadev and Purani, 2008; Yen and Lu, 2008)

H6: System Availability directly influences Trust (Sahadev and Purani, 2008)

H7: Efficiency directly influences E-Customer Satisfaction (Sun and *et al*, 2009; Sahadev and Purani, 2008; Yen and Lu, 2008)

H8: Efficiency directly influences Trust (Sahadev and Purani, 2008)

H9: E-Customer Satisfaction directly influences Trust (Ribbink, 2004, Sahadev and Purani, 2008; Kassim and Abdullah, 2010)

H10: E-Customer Satisfaction directly influences E-Loyalty (Chang and *et al.* 2009; Kuenzel, 2009; Terblanche, 2010; Wenying and Quan, 2010; Ribbink, 2004; Sahadev and Purani, 2008; Cristobal and eta al, 2007; Yen and Lu, 2008; Semeijn and *et al*, 2005)

H11: Customer Perceived Value directly influences E-Loyalty (Chang and *et al.* 2009; Wenying and Quan, 2010; Cristobal and *et al*, 2007)

H12: Trust directly influences E-Loyalty (Ribbink, 2004; Sahadev and Purani, 2008)

These 12 hypotheses can be conceptualized in a framework which is able to explain the effects of influential factors on e-loyalty.

2.2. DATA & Methodology:

The structural model is presented in figure 1. The model indicates the Privacy, Fulfillment, System availability, Efficiency and Customer perceived value are exogenous variables. Also, it is obvious that e-customer satisfaction, Trust and e-loyalty are endogenous variables.

This study employs Decision-Making Trial and Evaluation Laboratory (DEMATEL) method to evaluate causal linkages among four dimensions of e-service quality, e-satisfaction, trust, customer perceived value and e-loyalty. MATLAB software is applied to run DEMATEL method. DEMATEL is one of the Multiple Criteria Decision Making (MCDM) methods which is able to evaluate causal relationships among variables based on expert's opinions. Regarding to expert's opinions, DEMATEL can build a structural model which represents causal linkages among different dimensions through prioritizing these linkages. DEMATEL method frequently has been used in various areas of management science to determine linkages among variables and form a causal model.

In this study, opinions of 30 experts are collected to determine the interrelationships among understudy variables. Particularly, these experts evaluated 12 causal effects, assumed as research hypotheses, numerically.
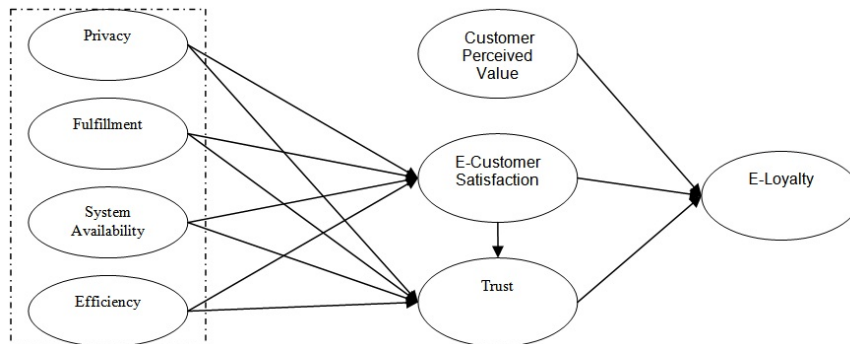

Fig. 1: The structural model of e-service quality, e-customer satisfaction, trust, customer perceived value, and loyalty

2. 2. 1. Decision-Making Trial and Evaluation Laboratory (DEMATEL):

According to Wu and *et al* (2008), DEMATEL procedure has five steps:

Step (1). Calculating direct-relation matrix: At the first step, experts are asked to determine the direct effects of dimensions on each other in five levels as listed below:

0: no influence
1: low influence
2: moderate influence
3: high influence
4: very high influence

These data are collected via a matrix-based questionnaire as presented in appendix 1. Then the Mean of each dimension is extracted from received matrices and placed in average matrix A.

Step (2). Calculating normalized direct-relation matrix: matrix A should be normalized through below formula.

$$X = k \cdot A$$

$$k = \frac{1}{\max\limits_{1 \le i \le n} \sum_{j=1}^{n} a_{ij}} , \quad i, j = 1, 2, ..., n$$

Step (3). Calculating Total-relation matrix: in this step Total relation matrix is calculated through below formula.

$$T = X(I - X)^{-1}$$

Step (4). Causal diagram: dimensions are grouped into cause and effect groups by computing (D-R) through below formula. Each dimension with positive (D-R) is categorized in cause group and each dimension with negative (D-R) is categorized in effect group. Also, importance of each dimension is reflected by (D+R).

$$T = \left[t_{ij} \right]_{n \times n}, i, j = 1, 2, ..., n$$

$$D = \left[\sum_{j=1}^{n} t_{ij} \right]_{n \times 1} = \left[t_i \right]_{n \times 1} \text{ Sum of rows}$$

$$R = \left[\sum_{i=1}^{n} t_{ij} \right]_{1 \times n}^{t} = \left[t_j \right]_{n \times 1} \text{ Sum of columns}$$

Step (5). Calculating the inner dependent matrix: The inner dependent matrix is calculated based on Total-relation matrix as the sum of each column should be 1.

2.3. Data Analysis:

1- Calculating direct-relation matrix:
A:

	V1	V2	V3	V4	V5	V6	V7	V8
Privacy	0	0	0	0	0	3.3	3.9	0
fulfillment	0	0	0	0	0	3.7	3.1	0
System availability	0	0	0	0	0	3.2	2.9	0
Efficiency	0	0	0	0	0	3.4	2.8	0
Customer perceived value	0	0	0	0	0	0		3.3
e-customer satisfaction	0	0	0	0	0	0	3.4	3.3
trust	0	0	0	0	0	0		3.4
e-loyalty	0	0	0	0	0	0	0	0

2- Calculating normalized direct-relation matrix:
X:

	V1	V2	V3	V4	V5	V6	V7	V8
Privacy	0	0	0	0	0	0.4583	0.5417	0
fulfillment	0	0	0	0	0	0.5139	0.4306	0
System availability	0	0	0	0	0	0.4444	0.4028	0
Efficiency	0	0	0	0	0	0.4722	0.3889	0
Customer perceived value	0	0	0	0	0	0		0.4583
e-customer satisfaction	0	0	0	0	0	0	0.4722	0.4583
trust	0	0	0	0	0	0	0	0.4722
e-loyalty	0	0	0	0	0	0	0	0

3- Calculating Total-relation matrix:
T:

	V1	V2	V3	V4	V5	V6	V7	V8
Privacy	0	0	0	0	0	0.4583	0.7581	0.5681
fulfillment	0	0	0	0	0	0.5139	0.6732	0.5534
System availability	0	0	0	0	0	0.4444	0.6127	0.4930
Efficiency	0	0	0	0	0	0.4722	0.6119	0.5054
Customer perceived value	0	0	0	0	0	0	0	0.4583
e-customer satisfaction	0	0	0	0	0	0	0.4722	0.6813
trust	0	0	0	0	0	0	0	0.4722
e-loyalty	0	0	0	0	0	0	0	0

4- Causal diagram:

Importance and effectiveness of the dimensions are presented in table (1).

**Table 1;** Importance (D+R) and effectiveness (D-R) of the dimensions

Dimensions	Sum of rows: (D)	Sum of column: (R)	D+R	D-R
Privacy	1.7845	0	1.7845	1.7845
fulfillment	1.7405	0	1.7405	1.7405
System availability	1.5501	0	1.5501	1.5501
Efficiency	1.5895	0	1.5895	1.5895
Customer perceived value	0.4583	0	0.4583	0.4583
e-customer satisfaction	1.1535	1.8888	3.0423	-0.7353
trust	0.4722	3.1281	3.6003	-2.6559
e-loyalty	0	3.7317	3.7317	-3.7317

5- Calculating the inner dependent matrix:

	V1	V2	V3	V4	V5	V6	V7	V8
Privacy	0	0	0	0	0	0.2426	0.2423	0.1522
fulfillment	0	0	0	0	0	0.2720	0.2152	0.1488
System availability	0	0	0	0	0	0.2352	0.1958	0.1321
Efficiency	0	0	0	0	0	0.25	0.1956	0.1354
Customer perceived value	0	0	0	0	0	0	0	0.1228
e-customer satisfaction	0	0	0	0	0	0	0.15095	0.1825
trust	0	0	0	0	0	0	0	0.1265
e-loyalty	0	0	0	0	0	0	0	0

RESULTS AND DISCUSSION

Based on importance and effectiveness of understudy dimensions (Table 1), a causal diagram can be drawn.
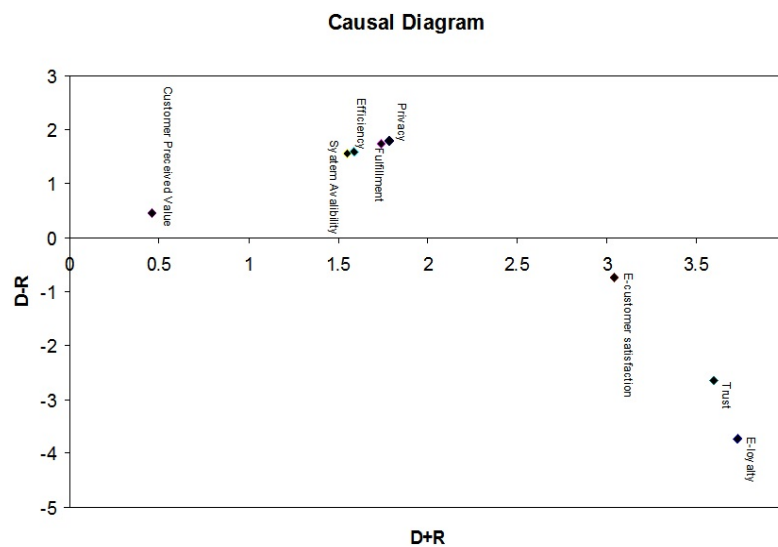
Fig. 2: Causal diagram

The diagram shows that e-loyalty, trust and e-customer satisfaction respectively have the most value on horizontal axis or D+R index. In other words, the results of DEMATEL analysis indicate e-loyalty, trust and e-customer satisfaction are the most significant dimensions in e-retailing system because they have highest (D+R).

Also, causal diagram reveals Privacy, Fulfillment and efficiency have the most value in vertical axis or D-R index. In other words, the results show Privacy, Fulfillment and Efficiency are the most effective variables in the system because they possess the highest (D-R).

Further, results reveal e-loyalty receives the most influences from other dimensions in online retailing. This strongly corresponds with primary assumption of research framework which claims e-loyalty can be explained by other understudy variables.

Furthermore, results revealed that among four e-quality service variables, Privacy and Fulfillment have the highest effectiveness in the system. This can increase the insight of managers of retailing system. In other words, if managers aim to increase loyalty of their customer through increasing the quality of their e-services, they should focus more on Privacy and Fulfillment aspects which are the most effective factors of e-service quality.

Further research:

This framework can be statistically tested in any e-retailing population in future studies. As the assumptions of this model are supported by both literature review and experts' opinions, it can be considered as the framework of other future studies trying to study e-loyalty.

Appendix 1: Direct-relation matrix of the responds

V1	V2	V3	V4	V5	V6	V7	V8
V1. Privacy					H1	H2	
V2. Fulfillment					H3	H4	
V3. System Availability					H5	H6	
V4. Efficiency					H7	H8	
V5. Customer Perceived Value							H11
V6. E-Customer Satisfaction						H9	H10
V7. Trust							H12

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