

## Investigating Relationship between Internet Brand Equity and Users' Satisfaction through Integration of ISM-DEMATEL Approaches (Case Study of the Google Brand and Iranian Users)

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**ABSTRACT** — Every-growing spread of internet and new brands developed based on internet make it necessary to carry out a research on the respective fields. To help managers and owners of brands to manage and develop their brands and perform customer relationship management (CRM) more effectively, the present study aims at examining relationship between two major components of a business in cyberspace, i.e. brand equity and users' satisfaction.

This study is classified as survey/descriptive type investigating the relationship between brand equity and users' satisfaction by integrating DEMATEL and Interpretive Structural Modeling (ISM) approaches. Reviewing the literature and identifying influential variables, we make a questionnaire and distribute it among 16 brand experts to determine level of effect and type of relationship between the variables. Then, conducting data analysis, the variables are examined to determine the degree by which they are influencing and influenced by each other and their causal relationships are illustrated in form of a model. Next, level of interaction and influence between the variables as well as intensity of relationship between them is quantitatively assessed by using DEMATEL analysis.

**KEY WORDS:** corrosion reinforced concrete; Persian Gulf; permeability; corrosion current strength; corrosion potentials

### Introduction

Conducting researches in fields of brand, branding and brand equity is one of the most significant issues receiving considerable attention, especially in branch of marketing studies, at the present time. Despite the importance of brand concept, there is no exhaustive definition put forward for brand value, especially in terms of internet brands, in marketing literature. However, taking all opinions into account, we come to this conclusion that the brand value refers to added value given to a product or service by a brand (Heding et al, 2009; American Marketing Association, 2015; Kapferer, 2010). Similar to the issue of brand, users' satisfaction, also, consists of various aspects and subsets. The customer's satisfaction is seen as the key to commercial success enhancing profitability (value-making). Many firms are actively in search of strategies to increase their brand value in competitive business environment of the present day. As the investment can only be returned through customers, therefore, making values to attract customers and make them wanting to pay for it is regarded as primary principle in business environment of the present era (Hill et al, 2010). Ever-growing development of internet and modern communicative tools enable customers to better and further challenge claims made by brands and give them freedom to turn to other brands if their expectations are not met. And that is where the customers' satisfaction comes under the spotlight (Shafiea and Jafari, 2011). Examining previously-performed researches in the fields of brand, customer's satisfaction and forging a strong tie with customers are key steps given considerable importance by the managers and owners of brands to develop strategies for branding, brand management and marketing. Therefore, conducting research on these given subjects seems essential.

### Research methodology and literature

Though the concept of brand value has been extensively discussed by researchers, internet brands have been inadequately addressed in the relevant studies. There is scarcity of studies in the field of internet (online) brands (Riquelme et al, 2010; Purcell et al, 2009). To put it more precisely, the internet brand can be seen as a structured set of data. The data, in this set, refers to information concerning products and services and organization status illustrated in form of texts, graphics, pictures and movies (Zahedi, 2011). Nowadays, internet users are estimated to make 42.3 percent of people around the world increasing 741 percent from 2000 to 2014. The number of internet users is 48.3 percent in the Middle East increasing 3303 percent between 2000 and 2014. This number is increased from 250K in 2000 to 46 million in 2014 in Iran which constitutes the largest number of internet users in the region (Stats, 2015). Spread of digital world and communication and information technologies, like personal computers, smart phones, computer networks, internet and electronic mails, has led to daily emergence of companies choose to

establish their business on the internet. Today, there are many online or internet-based firms performing their business entirely on the internet (Shafiea and Jafari Jou, 2011; Alexa, 2015). Iran represents no exception to this trend and Iranian users take advantage of a wide diversity of online products and services. Google is the most frequently visited website in Iran. The Iranians make up 2.9 percent of Google users standing 4<sup>th</sup> on list of top Google users worldwide. Blogfa, Varzesh3, Digikala and Aparat are seating on top of most visited websites in Iran respectively (Alexa, 2015). Scope of internet brand activities can be divided into three parts: business, content and connections. Business means selling products through internet, like what Amazon do. Content refers to create a sort of content for website and put it on the internet, namely news content or blogs. Connections mean to establish communication through performing businesses, such AOL activities as one of largest internet-based service providers in the U.S. (Glanser, 2005). To describe the brand value, we are to study credited scientific models enjoying validity and acceptability across the globe. To do so, models developed by Aaker, Keller, Young and Rubicam, Brandt and Johnson and Blake are examined and compared beside other reliable models in the field of brand equity and, then, influential variables are determined (Aaker, 1991; Brandt and Johnson, 1997; Keller, 2010; Blake project, 2015; Young and Rubicam, 2015). We must develop indices to assess and measure the customers' satisfaction. The importance of such indices is so great that countries examine them not only in case of various organizations and industries but also on national level and give National Customer Satisfaction Index (NCSI) as high importance as National Gross Product (NGP) and take advantage of such assessments and measurements to plan their macro and micro strategies (Maleki and Darabi, 2008). Concerning the customer satisfaction, we study credited scientific models enjoying acceptability across the globe. To do so, we examine American Customer Satisfaction Index (ACSI), European Customer Satisfaction Index (ECSI), Swiss Index of Customer Satisfaction (SWICS), Norway Customer Loyalty Barometer (NCSB), Swedish Customer Loyalty Barometer (SCSB), Iranian Customer Satisfaction Index (Grigoroudis and Siskos, 2009; ECSI, 2015; ACSI, 2015; Rahman Seresht and Khademi, 2010). Examining and comparing the given indices as well as taking experts' opinions into account, variables concerning the brand equity and customers satisfaction are selected as follow: brand awareness, brand image, customer loyalty, perceived quality, brand differentiation and product/service availability (as brand equity variables); and customer expectations, customer loyalty, customer complaint, perceived quality, brand image and product/service price (as customer satisfaction variables). All variables are listed below:

**Table 1. Research variables**

NO.	Variable	Description
1	Brand awareness	Brand awareness is ability of potential buyers to recognize and remind a brand as producer of a particular product category. Moreover, it is defined in terms of the customers' capacity to associate the brand with a given product category or special demands which results in purchasing.
2	Perceived quality	It is defined as the customer awareness of high quality of a product compared to others. In other words, it is customer perception of overall or superior quality of a given product or service to his/her disposition to their alternatives.
3	Brand image	It is everything in your mind related to a given brand, including customer mentality, product properties, usage or other associations with organization, brand identity and symbols.
4	Brand loyalty	A type of customer behavior based on which they would prefer to make their future purchases from the same brand or, to put it differently, "to continue their purchasing from current brand".
5	Brand differentiation	It indicates very special properties of a brand and its difference to rivals.
6	Customer expectations	Expectations any given customer has concerning quality and usability of a product or service in his/her mind before making a purchase or using a service.
7	Product/service price (cost)	Price or cost paid by the customer for a product or service.
8	Product/service availability	Product and service distribution and availability as one of factors having direct positive relationship with customer satisfaction.
9	Complaints	Customer complaints and dissatisfaction of a given product or service.

Additionally, the tables below summarizes finding of researches conducted on brand, internet brand and customer satisfaction.

**Table 2. Previously-conducted researches**

NO.	subject	Researcher	Findings
1	Ranking Effective factors in Building Trust on the Internet	Abzari et al, 2011	Effective factors in building trust on the internet are prioritized as follow: technological factors, creating overall situation to build institutional trust, high quality information, high quality of electronic transaction, behavioral characteristics of online buyers and, finally, capacity of internet-based providers of products and services.
2	Internet-based Service Brands	Berry, 2000	Given the very nature of inter-based companies as to be intangible and service-oriented, it is of high importance for them to develop a brand with which customers are familiar. The critical issue, which requires their careful attention, is lack of strategies to enhance their brands.
3	Brand Equity for Online Companies	Rios and Riquelme, 2008	Components of brand loyalty and brand association can play more significant role in creating brand equity for online companies than other components - such as brand awareness, brand association and brand loyalty - which are seen as the framework and basis of creating brand equity for offline companies though can only produce indirect effect on creating brand equity for online companies.
4	Web Equity: Developing a Framework for Creating Customer Value in Online Organization	Page and White, 2002	Factors influencing web awareness, familiarity and association include: type of web-based activity in terms of being commercial or non-commercial, website design, characteristics of venter and properties of product or service.
5	Toward Understanding the Web Equity	Lin, 2006	Factors influencing the web equity are identified and classified as primary factors, including Brand awareness, brand associations, perceived quality of the brand, brand loyalty; and secondary factors including marketing communications, customers' interaction and customer service.
6	Measuring Strength of Cyber Brand	Woon Na, et al, 1999	Influencing factors on the cyber brands equity include: brand awareness, power aspects of the brand image (properties, customer perception of value and interests), and brand attitude and brand associations.

**Methodology**

**Interpretive Structural Modeling (ISM)**

ISM is a good method to analyze effects produced by one component on the other ones. The method investigates complicated relationships between components of a system based on their order and direction. In other words, it is a tool whereby group can overcome complicity between components. This is an interpretive structural method developed by Agarval (2006) and later represented by Kannan in an article in 2007 (Kannan and Noorul Haq, 2007; Tizro, 2010; Agarval, 2007; Thakkar, 2007; Yung Ming-Han, 2015; Khan and Rahman, 2015).

**DEMATEL analysis**

DEMATEL (Decision Making Trial and Evaluation) technique was first introduced by Fonetla and Gabus in 1971. This technique, which is one of decision-making methods developed based on paired comparison analysis, represents a hierarchical structure of existing factors in a system along with mutual causal relationship between them, in a way that intensity of each given effect determined in form of numerical values, by taking advantage of experts' judgment to specify system components and forms a systematic structure between these components through employing principles of graph theory (Habibi et al, 2014; Wua and Chang, 2015; Kumar et al, 2016).

**Integration of ISM and DEMATEL approaches**

Data analysis, in this research, is conducted by using an integrated research methodology including ISM and DEMATEL approaches due to deficiencies and restrictions limiting the use of such techniques alone. Data analysis is first performed through ISM technique to investigate previously-determined variables from the perspective of the degree by which they are influencing and influenced by each other and construct a model for causal relationship between them. Then, employing DEMATEL method, we quantitatively determine level of influence and interaction between the variables as well as intensity of effects they produce of each other. Finally, putting results together, we come to conclusion and summarize relation between variables (Zhou et al, 2006; Ashtianpour and Zand Hessami, 2015; Wang et al, 2012).

**Data analysis**

**Interpretive Structural Modeling (ISM)**

**Reachability Matrix:**

The primary reachability matrix is created after substituting 4 symbols in Structural Self interaction Matrix (SSIM) by 1 and 0. The substitution is done in accordance with following rules:

If input (i,j) is "V" in SSIM, inputs (i,j) and (j,i) will be 1 and 0 in the reachability matrix respectively. If input (i,j) is "A" in SSIM, inputs (i,j) and (j,i) will be 0 and 1 in the reachability matrix respectively. If input (i,j) is "X" in SSIM, inputs (i,j) and (j,i) will be 1 and 1 in the reachability matrix respectively. If input (i,j) is "O" in SSIM, inputs (i,j) and (j,i) will be 0 and 0 in the reachability matrix respectively (Singh et al, 2003). The reachability matrix and SSIM can be described as follow:

Table 3. SSIM

Variable	9	8	7	6	5	4	3	2
1.Brand awareness	V	V	V	V	V	V	V	V
2.perceived quality	A	V	V	0	V	A	V	
3.Brand image	A	V	V	O	V	A		
4. Brand loyalty	A	V	V	V	V			
5. Brand differentiation	A	V	V	O				
6. Customer Expectations	A	A	V					
7. Product/service price	A	V						
8. Product/service availability	A							
9. Customer complaints								

Table 4. Reachability matrix

Variable	1	2	3	4	5	6	7	8	9	Dependence Power
1.Brand awareness	1	1	1	1	1	1	1	1	1	9
2.Perceived quality	0	1	1	0	1	0	1	1	0	4
3.Brand Image	0	1	1	0	1	0	1	0	0	4
4.Brand loyalty	0	1	1	1	1	1	1	1	1	8
5.Brand differentiation	0	1	1	0	1	0	1	1	0	5
6.customer expectations	0	0	1	1	0	0	1	0	0	2
7.Product/service price	0	1	1	1	1	1	1	1	0	7
8.Procuct/service availability	0	1	1	0	1	0	1	0	0	4
9.Customer complaints	1	1	1	1	1	0	1	0	0	5
Driving Power	2	4	9	2	8	4	9	8	1	

**Rating the variables**

Input, output and common data sets are made for each one of factors to rate and prioritize them in the final model. Each one of given sets are defined as follow:

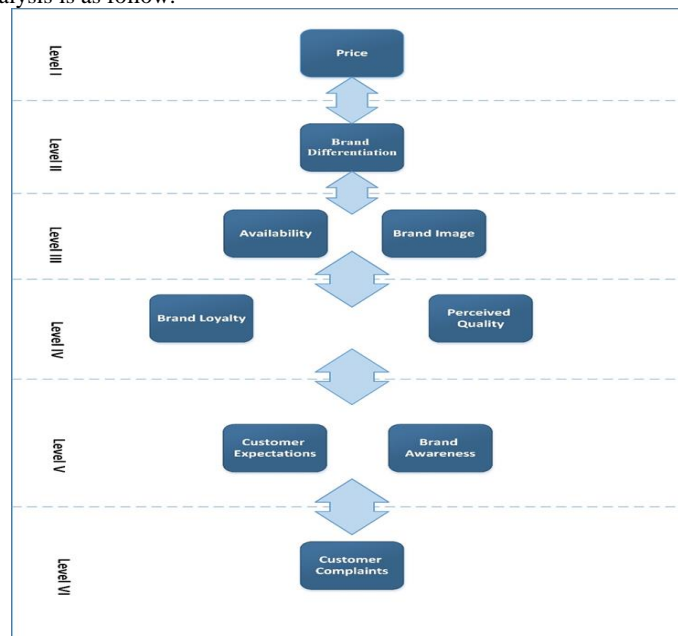
Output set: all factors contributing to factors under study + the factor itself

Common set: intersection of two mentioned sets. The more common elements of output and common set for a given factor, the higher level is the factor belonging to. Table below illustrates ranking for each factor calculated based on the above-mentioned guide line.

**Table 5.**Rating of factors (phase I)

variables	Input set	Output set	Common set	rank
1.Brand awareness	1,4	1,2,3,4,5,6,7,8,9	1,4	5
2.Perceived quality	1,2,4,5,7	2,3,5,7,8	2,5,7	4
3.Brand image	1,2,3,4,5,6,7,8,9	3,5,7,8	3,5,7,8	3
4.Brand loyalty	1,4,7	1,2,3,4,5,6,7,8	1,4,7	4
5.Brand differentiation	1,2,3,4,5,7,8,9	2,3,5,7,8	2,3,5,7,8	2
6. Customer expectations	1,3,4,7,9	3,6,7	3,7	5
7.Product/service price	1,2,3,4,5,6,7,8,9	2,3,4,5,6,7,8	2,3,4,5,6,7,8	1
8.Product/service availability	1,2,3,4,5,7,8,9	3,5,7,8	3,5,7,8	3
9.Customer complaints	1,9	9,3,5,6,7,8	9	6

Model derived from ISM analysis is as follow:



**Figure 1.** ISM model

**DEMATEL**

Following steps should be taken before employing DEMATEL technique to assess degree by which the factors are influencing and influence by each other:

**Create direct relation matrix:** completing questionnaire by 12 experts, the simple mean of their opinions is calculated concerning every paired factors and the direct relation matrix (M) is created.

**Table 6.** Rirect relation matrix

Variables	1.Brand awareness	2.Perceived quality	3.Brand image	4.Brand loyalty	5.Brand differentiation	6.Customer expectations	7. Proust/service price	8.Product/service availability	9.Customer complaints	
<b>1.Brand awareness</b>	0.000	3.000	3.000	3.333	2.833	3.500	2.667	1.333	2.833	22.500
<b>2.Perceived quality</b>	1.833	0.000	2.500	3.500	3.000	3.500	3.500	1.167	3.500	22.500
<b>3.Brand image</b>	2.833	3.000	0.000	3.167	3.167	3.333	2.833	1.167	2.500	22.000
<b>4.Brand loyalty</b>	2.667	2.833	3.000	0.000	2.500	3.333	2.667	1.500	3.500	22.000
<b>5.Brand differentiation</b>	3.333	3.167	3.500	3.500	0.000	3.000	2.833	2.167	2.667	24.167
<b>6.Customer Expectations</b>	2.167	3.333	3.000	2.833	2.500	0.000	3.000	2.167	3.167	22.167
<b>7.Product/service price</b>	1.500	2.833	2.667	2.667	2.333	3.167	0.000	1.667	3.333	20.167
<b>8.Product/service availability</b>	2.167	1.833	2.333	2.833	2.167	2.333	2.333	0.000	2.000	18.000
<b>9.Customer complaints</b>	0.667	2.500	2.167	2.333	1.167	2.000	1.667	1.833	0.000	14.333
<b>Total</b>	17.167	22.500	22.167	24.167	19.667	24.167	21.500	13.000	23.500	24.167

**Normalizing the direct relation matrix:**

**normalizing the matrix**

$$N = K \times M$$

K, in this formula, is determined by, first, calculating the total sum of all columns and rows and, then, reciprocating largest number for column and row.

**Calculating K in normalization**

$$k = \frac{1}{\max \sum_{j=1}^n a_{ij}}$$

**Total-relation matrix**

Total-relation matrix is calculated through following formula:

$$T = N \times (I - N)^{-1}$$

To calculate the total relation matrix, we must first form relative matrix effect on the total relation and, then, subtracting this matrix from identity (unit) matrix. At the end, the T matrix is formed through multiplying the transposed matrix, calculated in previous phase, by the direct-relation matrix.

**Create causal diagram**

To measure the degree by which indices are influencing and influenced by each other, we make use of two indices, namely R and J:

- Sum of elements on each row (R) for each factor indicates the degree by which that factor influence other factors of the system (variables' level of influence)
- Sum of elements on column (J) for each factors indicates the degree to which that factor is influenced by other factors of the system (variables' level of sensitivity)
- Therefore the horizontal vector (R+J) shows the degree by which a given factor is influencing or influenced by other factors. In other words, higher value of R+J for a given factor, more interaction has it with other system factors.
- Vertical vector (R – J) shows the level of influence. In general, if the value of R – J is positive, variable is of casual sort and, if this value is negative, variable is of affected type.

**Table 7.** Coordination of causal diagram

Variables	R	J	R+J	R-J
<b>1.Brand awareness</b>	6.882	5.286	12.168	1.596
<b>2.Perceived quality</b>	6.812	6.899	13.711	-0.087
<b>3.Brand image</b>	6.778	6.736	13.514	0.042
<b>4.Brand loyalty</b>	6.669	7.245	13.914	-0.576
<b>5.Brand differentiation</b>	7.338	6.030	13.368	1.308
<b>6.Customer Expectations</b>	6.708	7.298	14.006	-0.590
<b>7.Product/service price</b>	6.137	6.570	12.707	-0.433
<b>8.Product/service availability</b>	5.585	4.132	9.717	1.453
<b>9.Customer complaints</b>	4.496	7.207	11.703	-2.712

As it is noticeable in the table above, the order of indices by their level of influence on each other, which is measure by R is as follow: brand differentiation, brand awareness, perceived quality, brand image, customer’s expectations, brand loyalty, service or product price, service or product availability and customer complaints. The order of indices by their level of sensitivity is as follow: customer expectations, brand loyalty, customer complaints, perceived quality, brand image, service or product price, brand differentiation, brand awareness and product or service availability. Level of interaction for each one of indices is also measured by R+J. the order of indices by their level of interaction with other indices is as follow: customer expectations, brand loyalty, perceived quality, brand image, brand differentiation, product/service price, brand awareness, customer complaints, product/service availability. The criterion (R-J) is used to know whether the indices are causal or affected. The causal indices are brand awareness, product/service availability, brand differentiation and brand image respectively; and the affected indices are perceived quality, product/service price, brand loyalty, customer expectations and customer complaints respectively.

**Calculation of threshold of relations**

Threshold value must be measured to determine the Network Relation Map (NRM). Employing this method, we can overlook subtle relations and draw a reliable network of relations. Only relations can be illustrated in the NRM that their values in the T-matrix is greater than the threshold value (Tzeng et al, 2007). The threshold value can be simply calculated through computing average values in the T-matrix. When the level of threshold is determined, all values in the T-matrix that are smaller than the threshold become zero, i.e. they are ignored in the causal relationship and denoted in the matrix below by zero (0) number.

**Table 8.** Threshold of relations

Variables	1.Brand awareness	2.Perceived quality	3.Brand image	4.Brand loyalty	5.Brand differentiation	6.Customer expectations	7. Proust/service price	8.Product/service availability	9.Customer complaints
<b>1.Brand awareness</b>	0.000	0.839	0.820	0.884	0.740	0.896	0.792	0.000	0.866
<b>2.Perceived quality</b>	0.000	0.721	0.796	0.880	0.737	0.887	0.812	0.000	0.881
<b>3.Brand image</b>	0.000	0.828	0.000	0.868	0.742	0.880	0.787	0.000	0.843
<b>4.Brand loyalty</b>	0.000	0.810	0.797	0.738	0.000	0.866	0.769	0.000	0.864
<b>5.Brand differentiation</b>	0.716	0.819	0.884	0.941	0.000	0.931	0.843	0.000	0.909
<b>6.Customer Expectations</b>	0.000	0.830	0.801	0.848	0.712	0.749	0.785	0.000	0.856
<b>7.Product/service price</b>	0.000	0.753	0.731	0.778	0.000	0.800	0.000	0.000	0.800
<b>8.Product/service availability</b>	0.000	0.000	0.000	0.723	0.000	0.711	0.000	0.000	0.000
<b>9.Customer complaints</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

**Integration of ISM and DEMATEL**

Employing ISM approach, in the first phase of data analysis, we examined the selected variables in terms of the degree by which they are influencing and influenced by each other and demonstrated the causal relationships between them in form of a model including 6 levels. Then, adopting the DEMATEL method, we determined level of influence and communication between variables as well as strength and intensity of relationships quantitatively through taking advantages of results obtained from the threshold matrix including significant relations between variables. Finally, putting the results together, the level of relations between variables was drawn in form of a six-level model resulted from taking ISM approach as below.

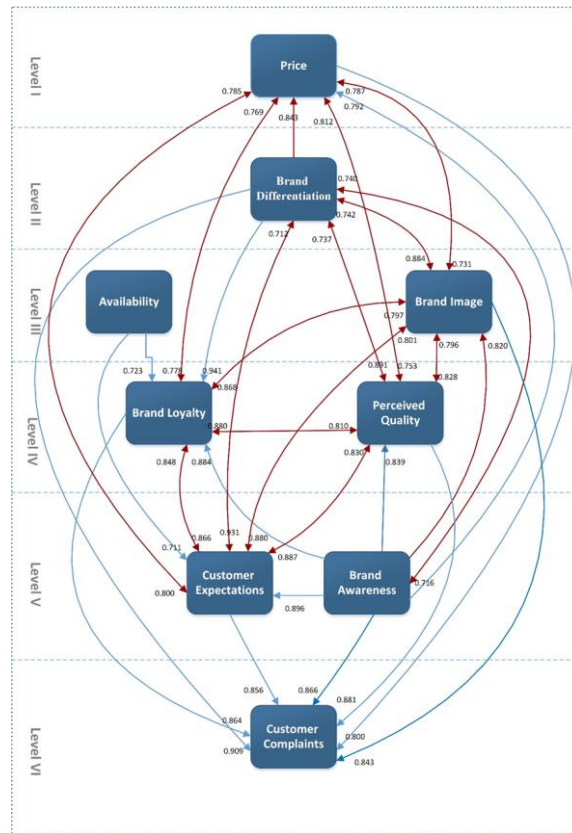


Figure 2. Integrated model including ISM and DEMATEL

## Conclusion

The primary objective of this research was to study the relationship between the internet brand equity and the users' satisfaction. To do so, an integration of ISM-DEMATEL approach was employed. Using ISM approach, the selected variables were examined in terms of the degree by which they were influencing and influenced by each other and the causal relationship between them were determined in form of a model. Next, taking DEMATEL analysis method, level of influence and interaction between variables were quantitatively determined besides the strength and intensity of their relations. The variables were prioritized on 6 levels, illustrated in the figure 1-3, on the ground of the results obtained from ISM analysis. Moreover, level of variables' influence on each other was determined based on the DEMATEL analysis. In general, the "brand differentiation" was recognized as the most influential variable. And, the "customer expectation" was found to be the most affected variable in terms of its levels of sensitivity. The level of other variables' influence on each other was, also, determined through ISM-DEMATEL integrated model. The ISM-DEMATEL integrated model shows the final result of the research. Given the results obtained from analyzing the data and model, we are to claim that there is a significant relationship between the internet brand equity and customers' satisfaction. The managers and owners of brands are suggested to use the information and results obtained for each one of variables in the research model for managing and developing their brand as well as managing customer communications. The ISM-DEMATEL integrated approach is also recommended to employ to carry out other studies on the subject of branding and marketing for examining the relationship between variables. And finally, researchers, use only the ISM approach, are advised to integrate various approaches - like SEM or ANP - to a composite methodology to overcome research limitations.

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