Prioritization of Dimensions of Online Trust Using Analytical Hierarchy Approach

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Abstract

In the past two decades, the e-commerce industry has grown exponentially. With new customers being on board everyday, understanding customer behavior has become more relevant than ever before. Trust is a vital aspect in the online shopping experience as it significantly influences consumer behavior, including the selection of e-commerce brands. Thorough literature review has yielded three dimensions of online trust, that is, ability, benevolence, and integrity, but no literature was found on whether there could be any prioritization among the three dimensions. This study used confirmatory factor analysis to verify the predefined scale of dimensions of online trust and analytical hierarchy process (AHP) technique to prioritize and solve a problem that required the multi-criteria decision making. The seminal contribution of this paper is ranking the three dimensions of online trust as identified in literature. The results affirmed that ability is the top ranked dimension of online trust for e-commerce brands that drives online shoppers followed by benevolence and integrity.

Keywords : **consumer behavior, online trust, ability, benevolence, integrity, AHP**

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Recent years have witnessed the internet boom. As per a Statista.com report, there are 4.66 billion active internet users worldwide, that is, 59.5% of the global population (Johnson, 2021). The same report stated that 92.6% people accessed the internet through their smartphones. IAMAI's 'Digital in India' report stated that there were 504 million active internet users in India ("India has over 500 mn active Internet users, 14% aged 5 –11 : Report," 2020) in year 2019. Among these, 433 million belonged to the age of 12 years and above. According to the same report, there was a rise of 9% in number of new users in case of male users and 21% rise in number of new female users adding to 26 million as compared to the users in the year 2018.

Electronic commerce has given a significant boost to the trade environment in India. Its e-commerce market is anticipated to rise from US$ 38.5 billion in 2017 to US$ 200 billion by 2026 (India Brand Equity Foundation, 2021). This market is anticipated to touch US$ 200 billion by 2027. The Indian government aims to create a trillion-dollar economy by leveraging technology by the year 2025. According to Kantar IMRB & Internet and Mobile Association of India (2017), online shoppers aged 25 – 34 years spent the maximum amount in online shopping. Interestingly, male shoppers spent more as compared to the female shoppers. Cash on delivery was the

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most chosen payment method (48%) followed by internet banking (17%), debit card (14%), credit card (10%), e - wallet (8%), and prepaid card/others (3%).

Some of the major reasons attributed to this exponential growth in India include rising internet penetration, whooping increase of smartphone users, convergence of customers across multiple e-commerce businesses, faster penetration of digital wallets, increasing middle class with disposable income, enhanced awareness of products, advances in logistics and payment solutions, maturity of 4G telecom network, government's policy frameworks such as 100% FDI under automatic route for the marketplace model of business to customer e-commerce, and 100% FDI in business to business e-commerce and 'Digital India' programme (IBEF, 2021 ; "India has over 500 mn active," 2020). However, challenges exist too : lack of robust payment mechanisms, distrust between buyers and sellers, privacy issues, high failure rate of payment gateways, non-standardized postal addresses, high return rate by Indian customers, logistical concerns, etc. need to be addressed, especially by Indian e-commerce companies (Debbarma & Nandi, 2014).

Trust has emerged as a significant factor in the e-commerce space (Thakur et al., 2017). Such environment necessitates the researchers to study the online trust in e-commerce. In this context, current research provides a thorough review of the contemporary research on online shopping, online trust, and its dimensions. This study measures the perception of online shoppers of India about trust involved in online purchases.

Review of Literature

Online shopping, unlike physical shopping, offers shoppers multiple choices in terms of product category under one roof, which may not be the case even in a retail outlet (Tomar et al., 2018). This makes it a convenient modus of shopping, being accessible 24×7. Shopping convenience has been defined as, "a reduction of the opportunity costs of effort and time involved in shopping" (Berry et al., 2002, p. 6). Online shopping saves time, makes it easier for shoppers to select products, often by comparing similar ones from competitors, review and compare product pricing (Le-Hoang, 2020), and also avail great discounts, special offers, and promotions (Ittaqullah et al., 2020).

In online shopping, there are always concerns in the customers' mind as it is full of uncertainty (Sinha & Singh, 2014). This makes trust a crucial factor, as it significantly affects consumer behavior (Kautish & Rai, 2019) and drives consumer attitudes for online shopping (Köksal & Penez, 2015).

The notion of trust, especially in a 'virtual world,' is imperative. Trust can be defined in several aspects, and it does not have any fixed definition. Trust is referred to as, "confidence in or reliance on some quality or attribute of a person or thing, or the truth of a statement" (Bhattacharya et al.,1998, p.461). Trust is studied as a multidisciplinary topic in organization, psychology, marketing, anthropology, sociology, sharing economy, marketing management, and most recently, in e - commerce (Panigrahi et al., 2018). Wu et al. (2018) defined trust in a retail context as, "a belief, confidence, sentiment, or expectation about an exchange partner's intention and/or likely behavior" (p. 31). In the marketing context, trust is defined as, "Psychological state comprising of intention to accept vulnerability based on one's positive expectation of the intentions or behaviors of another or willingness to rely on an exchange partner" (Singh & Sirdeshmukh, 2000, p.154). Trust in online shopping may be defined in different ways too ; for instance, as "one's confident expectation regarding an online situation of risk whereby one's vulnerabilities will not be exploited" (Beldad et al., 2010, p.860).

Online transactions encompass parting with financial and other confidential information. This information sharing often tends to create a lot of perceived risk and uncertainty among online shoppers (Guru et al., 2020). Researchers revealed that 'trust' can be achieved by imparting quality in various dimensions including service. Trust does help mitigate customers' anxieties about risks and uncertainties associated with complex online transactions (Oghazi et al.,2018).

Numerous studies have considered online measures of trust, that is, ability, benevolence, and integrity to calculate overall trust (Hallikainen & Laukkanen, 2021), loyalty (Kurup & Jain, 2018), and other attributes.

Table 1. ***Studies Conducted on Dimensions of Online Trust***

Authors	Dimensions of Online Trust	Statistical/ Mathematical Tool(s) Used
Hallikainen & Laukkanen (2021)	Ability, Integrity, Benevolence	Confirmatory factor analysis
Chowdhury & Ahmad (2012)	Ability, Integrity, Benevolence	Correlation and regression
Chen (2012)	Ability, Integrity, Benevolence	Confirmatory factor analysis
Gefen & Straub (2004)	Integrity, Predictability, Ability, Benevolence	Confirmatory factor analysis
Lee & Turban (2001)	Ability, Benevolence, Integrity	Multiple linear regression
McKnight & Chervany (2001)	Benevolence, Integrity, Competence, Predictability	Conceptual model

Dimension 'ability' alludes to, "companies' ability to fulfill promises made to customers" (Chen & Dhillon, 2003, p. 303). A company website would have ability, if it has skills and knowledge to accomplish the intended behavior (Bhattacherjee, 2002). Benevolence is an, "ability of a company to hold consumer interests ahead of their own self-interest" (Chen & Dhillon, 2003, p. 303). Benevolence thereby reflects the seller/vendor's care, motivating a customer to act (McKnight et al., 2002), while reducing uncertainties. It refers to proving openness and sympathy towards online shoppers and resolving their concerns in good-faith efforts (Bhattacherjee, 2002).

The 'integrity' dimension of online trust highlights the customer's belief that the e-commerce service provider would meet its promises, while keeping his/her confidential information secure throughout (McKnight & Chervany, 2001). It includes conduct of online transactions (timely delivery of product, accurate billing) as well as appropriate and secure use of private user information. Firms should build and abide by stringent terms and conditions shared with their customers, and also notify them if there are any changes made. By and large, integrity is the measure through which an individual may be convinced of the 'ethicality' of a vendor, thereby reducing customers' uncertainty regarding the online transactions (Gefen & Straub, 2004). Integrity can be defined as, "the trustor's perception that the trustee will adhere to a set of principles acceptable to the him/her during and after the exchange" (Mayer et al.,1995, p. 719). In online shopping, it means that an e-tailer performs in a consistent, reliable, and honest approach (Bhattacherjee, 2002). Several researchers have proposed that ability, benevolence, and integrity are the key measures of online trust. Table 1 presents the literature identifying various dimensions of trust along with statistical tools used by the researchers.

Objective of the Study

From Table 1, it is evident that several authors have examined the dimensions of online trust. However, the novelty of this study is ranking of these dimensions of trust using AHP. This paper aims to make an attempt to rank the three dimensions of online trust for e-commerce brands.

Research Methodology

The target population for this study was the regular online shoppers of India. Here, 'regular' denotes customers who did online shopping at least 3 – 4 times in a year. Data were collected through a cross-sectional research design using a standardized questionnaire from October 2018 – March 2019. Respondents were briefed about the purpose of the study as well as the constructs and scales used. In-person form of data collection ensured that the degree of accuracy was high.

In absence of sampling frame of online shoppers, convenience method was adopted for data collection. A total of 370 responses were obtained, seven out of these were dropped due to lack of holistic data. Out of final 363 sample size, breakup of male and female respondents was 53.6 % and 46.4%, respectively. Almost 45% were in the

age bracket of 21 – 30 years, 28.9% belonged to the age group of 30 – 40 years, while 16.1% belonged to more than 40 years category, and mere 10.1% were found to be from the less than 20 years age group category. Frequency wise, 13.7% respondents were frequent shoppers (i.e. once in a week), 52.7% shopped regularly (i.e. minimum one online purchase monthly), and 33.6 % engaged in online shopping once in 2 –5 months ; 72.3% respondents were found to be employed.

Research Instrument

A structured questionnaire, divided into two parts, was used for data collection. The first part of the questionnaire was used for validating the scale given by Bhattacherjee (2002) through confirmatory factor analysis (CFA). This scale consisted of nine statements for measuring the three constructs of online trust using a 7- point Likert scale, where 1 denoted *'strongly disagree'* and 7 denoted *'strongly agree.'* The second part of the questionnaire was in the form of a scale suggested by Saaty (1980) used for analytical hierarchy process (AHP). It measured the preferences of respondents in the context of association between three criteria, that is, ability, benevolence, and integrity. Before data collection, respondents were familiarized about the constructs followed by use of AHP for obtaining weights of each criteria.

Analysis and Results

Analytical Hierarchy Process (AHP)

Saaty (1990) propounded AHP to solve complex decision-making problems using multi-criteria decision analysis (MCDM). MCDM is a discipline of operations research containing numerous methods like analytic network process (ANP), TOPSIS, goal programming, PROMETHEE and MACBETH, AHP, among others (Guru et al., 2020).

This method has been widely used under various sectors, especially when faced with decision-making scenarios ; for instance, it has been used for decision-making related to choosing a suitable ERP system for SMEs (Bhatt et al., 2021), ranking the factors for international education destination selection by Indian students (Guru et al., 2021), ranking perceived risks in online shopping (Guru et al., 2020), selecting suppliers in automotive industry (Jayant, 2018), etc.

In effect, AHP helps in determining the importance of alternatives involved in a given decision making problem using Eigen value. This comprises of four steps for determining the weightage of factors, which include : hierarchical model building, AHP matrix and formulation, consistence and ranking check, and synthesis and consistency check.

Hierarchical Model for Dimensions of Online Trust

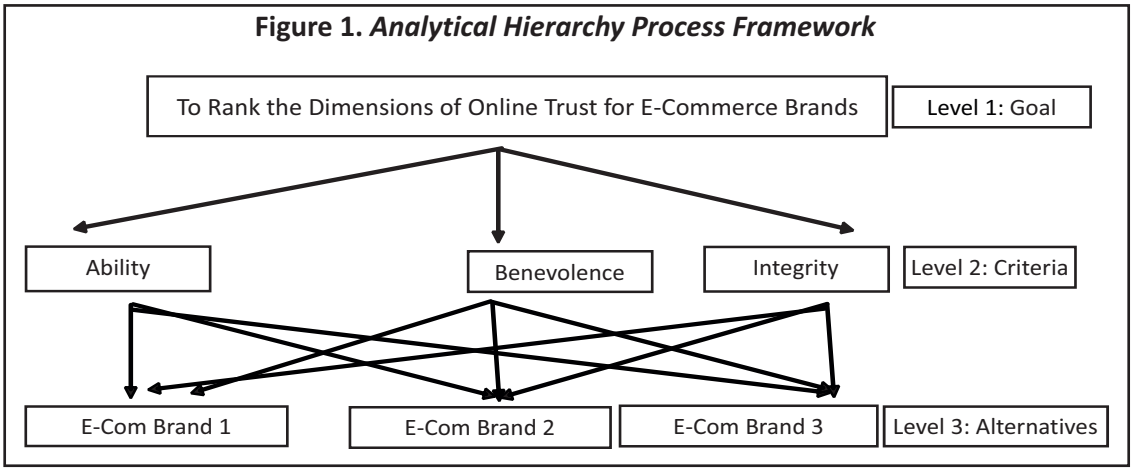
Three-level AHP framework is described in Figure 1.

↳ **Level 1 :** The highest level presents the goal related to the decision-making. For instance, for this research, the goal is to rank the dimensions of online trust for e-commerce brands.

↳ **Level 2 :** The second level defined the three criteria for AHP which are dimensions identified in literature for trust namely benevolence, ability, and integrity. These dimensions had been identified from an individual trust scale in online firms developed by Bhattacherjee (2002).

↳ **Level 3 :** The third level measured the criteria specified in level two for top three B2C e-commerce

Figure 1. ***Analytical Hierarchy Process Framework***



brands (alternatives) of India. These brands were selected on the basis of their market share in the year 2018 (Forrester, 2017).

AHP Matrices and Formulation

The next step is to find the priorities of different criteria related to the goal using pairwise comparison, which in turn generated a matrix which provided relative rankings for each level of hierarchy. The matrix was constructed using Satty's (1990) 1-3-5-7-9 scale, where 1 and 9 represent *equal importance* and *extreme importance*, respectively. Table 2 demonstrates a pairwise comparison matrix for one respondent (as an example).

Table 2. ***Pairwise Matrix for Dimensions of Online Trust (Level 2)***

Criteria	Ability	Benevolence	Integrity
Ability	1	5	5
Benevolence	1/5	1	3
Integrity	1/5	1/3	1

Let A be the pair-wise comparison matrix.

$$A = \begin{bmatrix} 1 & 5 & 5 \\ 1/5 & 1 & 3 \\ 1/5 & 1/3 & 1 \end{bmatrix}$$

Then, the ranking of priorities (known as Eigen vector X) is found by normalizing the values of the column by dividing each value by the sum of the column values and then taking the averages of overall row.

Normalized Column Sums **Row Averages**

$$A = \begin{bmatrix} 1 & 5 & 5 \\ 1/5 & 1 & 3 \\ 1/5 & 1/3 & 1 \end{bmatrix} \dashrightarrow \begin{bmatrix} 0.71 & 0.79 & 0.56 \\ 0.14 & 0.16 & 0.33 \\ 0.14 & 0.05 & 0.11 \end{bmatrix} \dashrightarrow X = \begin{bmatrix} 0.69 \\ 0.21 \\ 0.10 \end{bmatrix}$$

Priority Vector

Consistence and Ranking Check

Calculation of consistency of judgements (on scale mentioned above) is one of the vital steps in pairwise comparison. To ensure that each judgement is rational and reliable, matrix consistency is checked using consistency ratio *(CR)*. *CR* is determined in the following ways :

(1) Calculate λ_{Max} by considering $AX = \lambda_{Max} X$.

$$\begin{matrix} A & & X & = & AX & & X \end{matrix}$$
$$\begin{bmatrix} 1 & 5 & 5 \\ 1/5 & 1 & 3 \\ 1/5 & 1/3 & 1 \end{bmatrix} \begin{bmatrix} 0.69 \\ 0.21 \\ 0.10 \end{bmatrix} = \begin{bmatrix} 2.24 \\ 0.64 \\ 0.30 \end{bmatrix} = \lambda_{Max} \begin{bmatrix} 0.69 \\ 0.21 \\ 0.10 \end{bmatrix}$$

λ_{Max} = Average **{2.24/ 0.69, 0.64/0.21, 0.30/0.10} = 3.10.**

(2) Further, the consistency index is calculated for each matrix of n order using formula $\lambda_{Max} - n) / n - 1$.

Therefore, $CI = 0.048$.

Here, n refers to the number of elements ($n = 3$).

(3) The consistency ratio (CR) is determined by the formulae, $CR = CI/RCI$.

where, *RCI* denotes random consistency index.

Table required to calculate CR was provided by Saaty (1980). Due to three dimensions chosen in the paper, RCI value is 0.58. So, the value of CR is 0.0844.

Synthesis and Consistency Check

In this study, overall CR is 0.0844 (less than 10%), making the judgment matrix sufficiently consistent, therefore, it cleared the consistency check. In a similar manner, consistency ratio for each matrix and each level from 2 and 3 was analyzed and priority weights were identified. Table 3 summarizes the priority weights of criteria (Level 2) and top three e-commerce brands (Level 3) based on AHP.

Table 3. ***Final Synthesis of the Priorities***

Criteria	Relative Weight Using AHP (Level 2)	E - Commerce Brand	Relative Weight Using AHP (Level 3)
Ability	0.6231	Brand 1	0.6313
		Brand 2	0.2542
		Brand 3	0.1145
Benevolence	0.2571	Brand 1	0.5962
		Brand 2	0.2686
		Brand 3	0.1351
Integrity	0.1197	Brand 1	0.6000
		Brand 2	0.2625
		Brand 3	0.1375

Table 4. ***Final Synthesis : Ranks for Level 3***

E-Commerce Brand Alternatives	Weights	Ranking
Brand 1	0.6185	1
Brand 2	0.2589	2
Brand 3	0.1226	3

Measurement Model

CFA is used to validate the measurement model proposed by Bhattacherjee (2002). CFA is performed using AMOS software version 25. The χ^2/df ratio is 2.540, lesser than the suggested level of 5 (Bagozzi & Yi, 1988). Also, indices (CFI = 0.943, GFI = 0.962, IFI = 0.944, NFI = 0.912, AGFI = 0.930, and RMSEA = 0.068) fulfilled the criteria. Largely, good fit is observed between the observed data and measurement model.

Then, convergent validity and reliability are assessed to check the psychometric properties of the hypothesized model. Using Cronbach's alpha, the reliability of each dimension of online trust is checked (Table 5). Values between 0.736 – 0.919 show good internal consistency. Assessment of convergent validity is done through examination of factor loading of various indicators of the dimension of online trust, that must be higher than 0.5 (Anderson & Gerbing, 1988). Table 5 highlights that each factor loading is significant and higher than 0.5, establishing the convergent validity. This is established as the threshold of average variance extracted (AVE), that is, 0.5 and composite reliability (CR), that is, 0.7, respectively provided by Hair et al. (2006).

Table 5. ***Outcomes of CFA***

Construct and Items (Refer to Appendix)	Factor Loading	CR	AVE	Cronbach's Alpha
Ability				
AB1	.819	0.836	0.631	0.707
AB2	.836			
AB3	.724			
Integrity				
INT1	.814	0.834	0.628	0.704
INT2	.732			
INT3	.828			
Benevolence				
BEN1	.804	0.830	0.621	0.710
BEN 2	.733			
BEN 3	.825			

Discussion

This study is aimed at prioritizing three dimensions of online trust through the deployment of the AHP method. In the case of criteria level, that is, Level 2 ; Ability with 0.6231 weight emerges as the top ranked dimension of online trust for e-commerce brands that drives online shoppers to shop online. Benevolence (weight : 0.2571) and integrity (weight : 0.1197) are prioritized as second and third levels, respectively, whereby the weight is directly proportional to customers' trust.

Ability, being the most important dimension of online trust, significantly influences customers' purchase intentions. Ability here refers to organizational (including employees) competence and knowledge, resulting in effective execution of end-to-end processes. Customers gain trust in an e-commerce vendor's ability through tangible evidences, therefore, online retailers should provide confidence to users by publishing information like gross merchandise value (GMV), total number of customers, accounts, items sold, number of suppliers available, number of pincodes / zipcodes served, return policy, and other transaction information on the website. Customers also judge online shoppers' ability through interpersonal competence. This necessitates the need for appropriate and regular behavioural trainings for customer-facing employees of online retailers like call centre executives, delivery persons, etc.

Benevolence comes next in terms of playing an important role in online trust. Online retailers must ,therefore, show receptivity and empathy towards users' concerns and needs even when it may seem expensive to the online firm. They should proactively make efforts in 'good-faith' to resolve users' concerns. Surprisingly, the dimension of integrity received very less weightage (0.1197). It is reflected in terms of timely delivery of products, accurate and timely billing, ensuring security and privacy of personal information, providing accurate quotes, and timely notification of fulfilled transactions. Least priority for integrity may be due to the reason that B2C e-commerce in India is a highly competitive market, thus integrity has assumed a hygiene factor. This insight can help online retailers in aligning with customers' expectations and their offerings.

Weights of dimensions of online trust also help us in prioritization of selected e-commerce brands (Level 3). In online trust dimensions, e-commerce Brand 1 received the highest weight of 0.6185 followed by Brand 2 (0.2589) and Brand 3 (0.1226) (Table 4). E-commerce Brand 1 is found to be highly trustworthy in comparison to other brands in all dimensions, that is, ability (0.6313), benevolence (0.5962), and integrity (0.6000). E-commerce Brand 2 and Brand 3 can make use of these findings to benchmark their service marketing mix with e-commerce Brand 1 to reduce the gaps in all dimensions of online trust.

Implications

The literature review has highlighted that ability, benevolence, and integrity are the major determinants of online trust. By prioritizing these dimensions, this research augments the existing domain knowledge and also provides imperatives for key stakeholders. First, this study will help B2C e-commerce companies to develop and implement strategies to increase online trust of their existing and potential customers in their brand. The results have implications for different facets of e-tailers' functional strategies like services, SCM, HRM, collaborations, etc. It highlights the importance of ethical dimensions too. Second, while this study provides overall ranks, e-commerce companies can conduct category-wise or region-wise study for measuring customers' perception. Based on this, they can make suitable changes in their business model, provide superior value, and enhance their word-of-mouth publicity. This would help these firms to position themselves for higher growth. Third, with little tweaking, B2B e-commerce companies can also use this methodology to assess their position vis-a-vis their competitors. Fourth, Ministry of Electronics and Information Technology (MeitY) of India should design appropriate framework and code of conduct (covering people, processes, and technology issues) in consultation with National Association of Software and Services Companies (NASSCOM) and Internet and Mobile Association of India (IAMAI), key e-commerce players, and other relevant stakeholders for achieving the twin objectives of growing the industry along with safeguarding the customers' interests.

Limitations of the Study and Scope for Further Research

While this study makes an attempt to rank the dimensions of online trust for top B2C e-commerce brands of India,

it is not without limitations. As the data were collected from limited urban areas in India, therefore, the findings may not be generalized for the whole country. This study opens the doors for studying individual components of online trust in detail as well as other demographic and psychographic variables to enhance the understanding of online buying behavior.

Authors' Contribution

Dr. Sunita Guru conceived the idea to undertake this primary research. Dr. Nityesh Bhatt developed the research design, supervised the study, and performed the required language editing. Literature review and data collection were performed by Mr. Nishant and Dr. Guru. Data analysis was done by Dr. Sunita Guru. Dr. Bhatt took the lead for writing the manuscript with active support of both the authors.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter, or materials discussed in this manuscript.

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Appendix

Dimensions of Online Trust	Items
AB1	The e-commerce brand has the skills and expertise to perform transactions in an expected manner.
AB2	The e-commerce brand has access to the information needed to handle transactions appropriately.
AB3	The e-commerce brand has the ability to meet most customer needs.
INT1	The e-commerce brand is fair in its conduct of customer transactions.
INT2	The e-commerce brand is fair in its use of private user data collected during a transaction.
INT3	The e-commerce brand is fair in its customer service policies following a transaction.
BEN1	The e-commerce brand is open and receptive to customer needs.
BEN2	The e-commerce brand keeps its customers' best interest in mind during most transactions.
BEN3	The e-commerce brand makes good-faith efforts to address most customer concerns.

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