Determinants of Voter Perception Towards E-voting System in India : A Confirmatory Factor Analysis

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Abstract

The aim of the present study was to examine voters' perception towards e-voting system in India. Here, e-voting system refers to online voting anywhere in the country by voters in public elections. The goals of an e-voting system is to increase voter participation and relieve congestion at polling stations on election day. E-voting is similar to "no-excuse" absentee voting. E-voting system can increase participation of voters in India. The main reason for conducting the research was to know the perception of voters towards acceptability of digital India campaign led by the Government of India. Responses were gathered from 276 prospective travelers having a transferable job who may not be present in their city at the time of voting. Computer aided qualitative data analysis software (CAQDAS) was used to explore the factors using content analysis and the same was empirically experimented by using EFA and CFA through SPSS and AMOS software. The finding suggested that new factors conveyed the perceptions of voters towards accepting e-voting system concepts in India. Further, government organizations as well as voters may perhaps benefit from the research outcome. E-voting may be thought of as a solution of replacing the ballet box and it can lead to transformation of India from a developing into a developed nation.

Keywords: E-voting, voter perception

I. INTRODUCTION

The present study was based on the initiative taken by Prime Minister Narendra Modi for the digital India campaign. Presently, India is in the era of transforming from a developing nation into a developed one. Now a days, the people of the country are more focused on using new technology, namely e-wallet, or online transactions. Specifically, if we talk about the voting system, the current situation shows that high numbers of voters are not showing interest in voting due to busy schedule followed by several security related issues they face during online processing. Furthermore, some researchers show that an attacker may flood a network and hinder access to a service of a particular user. From the literature review it was observed that usage of e-voting system in Nigeria had been accepted [9]. However, some bug fixes are required in the e-voting system. Moreover, some studies showed that voters willingly adopted e-voting system and they had faith in digital processing [2]. However, the automated system is working in a silent way. Most of the voters still believe in a manual system of operation, i.e. voting through offline mode because of multifarious security issues. Voters thinks that anyone may steal his/her voting name [3]. From literature review it was also noticed that with the usage of voting system in India dishonest insiders or other criminals with physical or logical access to mobiles may steal votes. India should carefully reconsider how to achieve a secure and transparent e-voting system that is suitable to its national values and requirements. With this backdrop, the present research aspired to develop an empirical model perception, a belief that could form the basis for better understanding of the determinants of voters' perception of e-voting system. Therefore, the objective of this paper was to identify the factors that contribute to perception about e-voting system along with a test to empirically identify factors.

II. REVIEW OF LITERATURE

More [7] suggested that e-voting increased "*voter participation*". People who were unable to vote were encouraged by the e-voting system. The electronic

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voting system also saved money, such as reducing expenses for locations and employees. Although the initial investment of e-voting system was expensive but after the system was established,expenses were minimized. Additionally, Tal [12] said that different persons behaved differently regarding the voting system, where some persons had strong interest in their preferred candidate. On the other hand, some persons avoided voting on election day. Furthermore, some people decided their candidate,they did not bother about the performance of the candidate.This behavior of voters lead to "*infeasibility"*. However, Ameen [1] suggested that "*security"* plays an important role in the e-voting system. This study also talked about the reliability factor as an important function to perform and maintain the confidentiality of the e-voting system. Moreover, Osstveen [8] focused on the social and psychological areas of voting system. E-voting system also had a major effect on political representation. Voters did not accept electronic systems due to "*lack of awareness"* of digital technology. Springall [11] focused on the "*security analysis"* of the e-voting system. E-votings system lead to "*transparency"*. This shows that software developers desired to work with the security community. Moreover, Kitlan [4] suggested that "*experience and trust"* were two main factors affecting e-voting. Individual experience, either positive or negative also affected e-voting. Individual voter characteristics influenced decision to use e-voting.

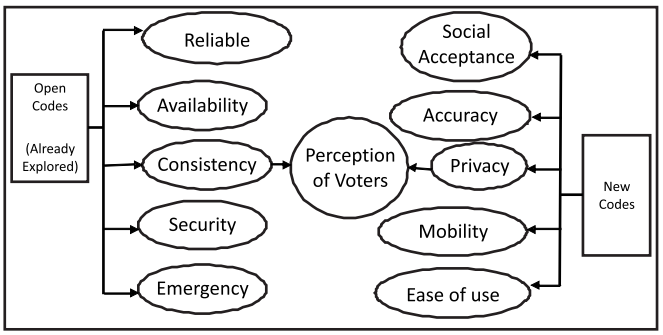
III. MATERIAL AND METHODS

For analyzing the data, responses were collected through open ended questionnaires referred from Saha and Chandra (2016).Subsequently, the questions asked were : a) *How voters perceived usage of e-voting system in elections?* b) *What are the pros and cons of using e-voting system?* A total of 276 responses were gathered through convenience and snowball sampling techniques from voters who were out of town during elections during 2015 elections. The period of data collection was from November 1, 2016 to December 31, 2016. For possible analysis of voter's perception of e-voting system, their responses were collected for questionnaire made up of Likert Scale for empirical validation of the factors explored through content analysis. A computer aided qualitative data analysis software (CAQDAS) package called Atlas.ti 7 were used to perform content analysis referred from Saha and Chandra (2016), and SPSS along with AMOS which was used for analyzing EFA and CFA.

IV. DETERMINANTS BUILDING PERCEPTION OF E-VOTING SYSTEM

After effectively administering content analysis, researchers came up with abundant codes suggested by Wright (2008), Saha, and Chandra (2016). These open codes helped the study in establishing relationship with both impetus and deterrent factors regarding e-voting system usage (Saha and Chandra, 2016).The newly identifiable codes are shown in fig. 1.

Fig. 1. Previously discovered codes and newly found codes



Content analysis results (fig. 1) reflect that most of the voters found e-voting system '*Reliable'* and this is a positive trait.

Availability means availability on web sites, and mobile apps, which will increase voter participation.

'*Security*' is provided by e-voting system and only the eligible voter can access his/her account to vote.

Accuracy is the most important factor for e-voting system. If the input is incorrect, then the results will not be correct, so it is not possible to change the vote.

Privacy is a concern of all voters. Some voters faced troubles while working with the voting system and so, an employee helps voters. However, this can intrude into the privacy of the voter. Privacy factor is important for avoiding vote purchase and coercion.

Mobility - a technique is mobile if there are no constraints on the place from which a voter can cast a vote. Mobility of the system can provide voters the facility of voting anywhere where an internet connection is accessible. This feature is better suitable for an e-voting system.

Social acceptance - a system has social acceptance if it has favorable acknowledgement and is seen as an efficient system by the voting population . It is easy to check the voters connected to the system. Currently, community perveives the majority of e-voting as unusable and not private.

Consistency means that it performs effectively in every place, at each location and the functions operate

absolutely as designed. Each voting system must be the same everywhere to assure consistency and quality control. This also leads to increase in the use of voting system. As the voting approach does not change between locations, it is especially valuable in our mobile society.

Ease of use means that the e-voting system is easy to use as it is an automatic process that saves time of voters. For instance, one of the respondents said "automatic operation saves time as well as if you are not present at your location you can vote from your current location". Likewise, in *'emergency'* cases, voters perceive that use of automated voting system saves their time.

On the other hand, results also show that there are negative mind-sets along with the multifarious concerns among voters such as security, 'privacy, and non-awareness about e-voting concepts. Moreover, it is also observed that the reason for less use of e-voting system is *lack of public awareness.*

Subsequently, explored factors were tested empirically using factor analysis. Later it was confirmed using explored factor by using CFA by using AMOS software. Out of total 11 explored factors through content analysis, here researchers selected top five preferred factors based on the major percentage shared by these factors (Table I). The resulting factor solution for the EFA items after removing cross-loading is represented in Table II. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy value is 0.76 and Bartlett's Test of Sphericity (BTS) is 3658.23 ($p<0.001$).This suggests that the sample is appropriate for factor analysis. The fifteen scale items formed five factors in EFA, explaining a total variance of 62.81%.

The scree plot test of EFA results also shows that a five factor model is appropriate. Following the analytical criteria, the factor structure affirmed that all items conveniently loaded on their designated factors. Moreover, all the remaining items had factor loading values equal to or greater than the minimum threshold of 0.6 and they were loaded on the intended factor.

Secondly, CFA was conducted to further validate the factor matrix structure of the explored factor that was resolved through the EFA. For analyzing the CFA, it was suggested that a minimum of 10 respondents for each scale item were desirable (Kline, 2005). Therefore, in the current study a total of 15 observed variables and a sample size of 276, which is beyond the desirable sample size of 150 were considered. Overall, the findings of CFA on the five factor model with 15 variables (social acceptance, accuracy, privacy, mobility, and ease of use) shows that the factor structure of the scale items was of a good fit for the data (fig. 2.).

TABLE I.
EXPLORED FACTORS CONSENT IN PERCENTAGE SHOWN BY THE POPULACE

S. No	Factors	Consent shown by the populace (%)	Verbatim (Responses)
1	Confidentiality	48	Only registered voters can vote using their account using mobile
2	Reliable	38	Continuous process, but it can break due to any reason, either environmental or hacker attacks
3	Social Acceptance	58	Voters believe in the digital era.
4	Security	50	Fear of frauds and hackers.
5	Accuracy	57	Voting through mobile is accurate in calculation or it is easy to count votes.
6	Availability	65	Voters can vote from any location, whether he/she is physically present or not.
7	Privacy	79	Secrecy level is high in e-voting system due to authorized access
8	Ease of Use	76	Use of electronic devices is very easy
9	Mobility	86	With modern technology, mobile is the first choice of human.
10	Emergency	49	Sometimes the internet connection fails.
11	Non-awareness	48	Uneducated voters are unable to use electronic gadgets and they are unable to understand instructions in English

The normed chi-square (x^2/df= 2.670), RMSEA (0.069), and CFI (0.92) are all within the acceptable range. The scale shows good reliability. Cronbach's alpha coefficients of all five factors are greater than 0.70 ranging from 0.70 to 0.90 and the AVE values of the factors range from 0.45 to 0.71 indicating that our explored factors are of acceptable reliability characteristics (Table III). All critical ratio values exceed 2.58 for a two-tail test. Overall, the factors are of acceptable convergent validity. All inter-factor correlations are below 0.85 and a squared correlation between two latent constructs is lower than the AVE values for each respective construct, indicating that the factors are of acceptable discriminant validity.

TABLE II.
FACTOR ANALYSIS SCORE OF FIVE EXPLORED FACTORS

Factors and scale items	Factor loading value				
	1	2	3	4	5
Social acceptance					
1. Awareness among the populace	0.762				
2. Support of friends and family	0.751				
3. Other than family and friends, people who know voters their agreeable belief on e-voting	0.745				
Accuracy					
1. Real time information		0.773			
2. Easy to access online system		0.762			
3. Correct calculations		0.758			
Privacy					
1. Secrecy in casting vote			0.805		
2. Instructions to vote available in all languages,the voter can select language			0.792		
3. One time vote system			0.766		
Mobility					
1. Availability is everywhere				0.703	
2. First choice of people is mobile for modern technology				0.691	
3. Can vote from any location				0.679	
Ease of Use					
1. Easy to count votes					0.661
2. Easy to use digital gadgets					0.734
3. Time saving					0.816

TABLE III.
MEAN, STANDARD DEVIATION, CRONBACH'S ALPHA, AVE, AND INTER-FACTOR CORRELATION

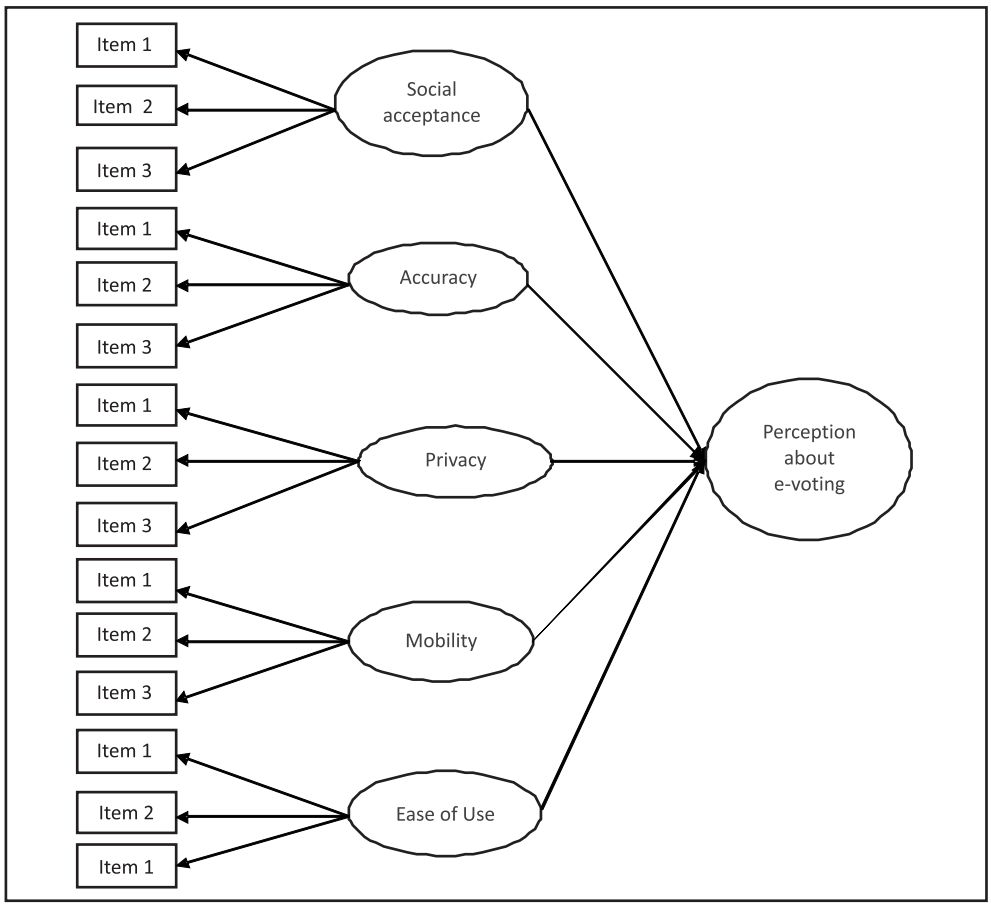
Factor	M	SD	α	AV	Inter-factor correlations				
					SE	AC	PR	MO	EU
Social acceptance	5.101	1.297	0.753	0.524					
Accuracy	4.754	1.470	0.764	0.578	0.512**				
Privacy	3.216	1.387	0.787	0.507	0.187	0.446**			
Mobility	2.396	1.169	0.691	0.562	0.098	0.174	0.491**		
Ease of Use	3.693	1.563	0.737	0.534	0.413	0.038	0.38	0.521**	

Source: Authors' calculation

V. CONCLUSION

The primary aim of this study was to identify factors affecting voter perception towards e-voting system. The researchers identified eleven factors that possibly explained the perception of the populace towards e-voting system. Some factors were already explored by other researchers in their respective countries and a few were found similar to the Indian context. Moreover, to get additional insight researchers also experimented with

Fig. 2. Dimensions of the perception of populace towards e-voting through CFA scale



the explored factor with testing EFA, then CFA to confirm these factors as valid perception of voters with respect to online voting system. Thus, to make the voting system easier and transparent most of the countries rolled out an automated voting system from manual system of operation for voter participation. The study shows significantly the view of voters towards using the e-voting system in elections. Using the view of voters further shows their consent for using automated voting systems. The government may use these inputs to make voters aware about e-voting system usage and safety of online voting systems. To summarize, the current study proposed the factors that were explored through content analysis as valid and reliable and perception of Indian voters about e-voting system was explored.

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