



PERCEPTION OF EDUCATED CITIZENS ON AADHAR CARD AS A TOOL FOR EFFICIENT E-GOVERNANCE IN INDIA - A CONCEPTUAL MODEL

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Article History: Received on 18th February 2020, Revised on 28th April 2020, Published on 10th May 2020

Abstract

Purpose of the study: The research study is an attempt made to understand the perception of residents on Aadhar card (Biometric identification) as a tool for E-Governance in India.

Methodology: For this study, purposive sampling is used and 400 samples are drawn from educated residents within India. The study has adopted Structural Equation Modeling through AMOS to test the hypotheses and build the conceptual model by using five indicators and 35 items.

Findings: The results reveal that only Reliability has a significant impact on the Efficiency of Aadhar card as an E-Governance tool. The study results indicate that Concern as a factor has a negative impact on Efficiency but statistically insignificant.

Implications of the study: The understanding of the perception of residents on Aadhar card as a tool for E-Governance is important for policymakers to bring in better governance and proper implementation of efficient Information and Communication Technologies (ICTs).

Novelty/Originality of the study: The study gives a unique insight into examining the perception of residents as to how efficient Aadhar card is as a tool for E-Governance.

Keywords: Aadhar Card, UIDIA, Biometric, Reliability, Data Privacy, E-Governance, India.

INTRODUCTION

Aadhar card is the world's largest biometric identification. This project was launched on 28th January 2009 by the then Planning Commission of India, to provide a 12 digit unique identification (UID) number to every resident of India. The cost of the projects as of August 2019 was US\$1.6 billion. The project is run by UIDAI – Unique Identification Authority of India under the aegis of the Ministry of Electronics and Information Technology as an E-governance tool and a key to open the threshold to transform India into digital India (Pandey, 2018).

Aadhar number generated through a multi-modal framework, it has biometric information like residents fingerprint scan, iris scan, photograph, and demographic information. As of October 2019, a total of 1.24 billion Aadhar cards were generated. The demographic composition of the Aadhar card as per the UIDAI (2019) records, 3.63% are children (males 1.84%, females 1.79%) below 5 years, 23.31% between the age group of 5 and 18 years (12.17% males, 11.14% females) and remaining 73.06% are above 18 years (37.65% males, 35.4% females).

E-Governance creates a strong mechanism through a robust new information and communication technologies (ICTs). The literature review on the efficiency of ICTs as a strong governance tool explains the potential of ICTs in E-Governance. E-Governance is a route to good governance (Heeks, 2001) is a tool for government interface with the citizens (Bhatnagar, 2004) it also affects the viewpoint of citizens about the government and governance. Citizens form an image of governance based on the effectiveness of ICTs (Corbridge et al., 2005). Research on this subject (Madon, 2005) opened a new threshold of literature on digital infrastructure as a route for social and financial transfers in the new age reforms. The usage of biometric systems, especially using a multi-modal framework, in business and government applications helps to increase citizen's awareness and E-Governance momentum (Banerjee, 2016).

Aadhar as an E-Governance tool in the second highly populated country in the world like India, with a population of 1.35 billion as of 2018 (UN Data) is both a boon and bane. On one side India as an emerging knowledge-based economy has overcome many hurdles through its human resource development and digitization. On the contrary, many residents are digital illiterates and live in areas where both physical, as well as digital connectivity, is a challenge. In these circumstances, the creation of a unique digital identity viz. Aadhar card as an effective and efficient tool for E-Governance is a herculean task unless the technology is in place and every stakeholder is involved.



Developed countries like UK, Germany, and Australia who have implemented the biometric systems in the past have shown that E-Governance initiatives, without proper systems in place and complete awareness among citizens about the advantages and disadvantages of E-Governance could prove to be a great failure. These paradoxical observations motivated us to study the perceptions of educated citizens of the second-highest populated country in the world. This study will also identify the gaps in the present scenario and helps the policymakers to plan better and efficient E-Governance strategies for the future and to leverage Aadhar as a tool for E-Governance.

REVIEW OF LITERATURE

This section presents a birds-eye view on the existing research on Aadhar as a tool for e-governance about its genesis, prospects, problems, and few solutions provided in the research papers for the problems.

The Unique Identification Number which is created for every citizen is unique. Aadhar authentication service enables verification of the identity digitally online anytime and from anywhere. Aadhar is only an identity of a resident through biometric attributes which can be verified online through its intrinsic value. This number will neither confer citizenship nor guarantee rights and benefits. Aadhar linking is an E-Governance initiative aimed at enhancing the quality of service delivery of various social welfare schemes of the Government of India, to facilitate financial inclusion and to develop Aadhar enabled applications. [Karthik, Paul, & Sukhtankar \(2016\)](#) in their study on the efficiency and effectiveness of smart cards, found that systems had delivered quick, anticipatable, and less corrupt payment processes with no exclusions of beneficiaries due to technological issues. According to these authors, this is one of the reasons to incorporate Aadhar's link to Direct Benefit Transfer (DBT) to various social welfare schemes. Direct savings to the Government in public-sector because of Aadhar card implementation until March 2018 is INR. 90012 crores from LPG, rural development, and a few other sectors ([UIDAI, 2018](#)). According to [Pandey \(2017\)](#) evolution of Aadhar, as an ICTs tool helps to monitor various transactions of citizens in India. Out of the 1.7 billion transactions, as of July 2016, 98.4 percent are successful in transferring money to the bank accounts of the beneficiaries because of the linking of Aadhar card. The implementation of Aadhar card has helped in considerably reducing the gender gap in providing access to financial services. According to World Bank data, 77 percent of women against 83 percent of men have bank accounts. Data also showed that the leakage of funds for pension payments in 2017 dropped by 47 percent when the payments were made through biometric smart cards rather than in cash (globalindex.worldbank.org). On the other hand [Agrawal et. al., \(2017\)](#), [Naresh et. al., \(2017\)](#), and [Tabish et. al., \(2017\)](#) found in their studies that voting linked with Aadhar verification is more secure, safe and saves time and money. As per the study on the cost-benefit analysis of Aadhar by the National Institute of Public Finance and Policy, the Aadhar project will yield an Internal Rate of Return of 52.85 percent to the Government by way of efficient and effective use of Aadhar. [Wilkinson \(1992\)](#) in his research identified some indicators to measure the efficiency of biometric systems like relevance, capacity, efficiency, timeliness, accessibility, flexibility, accuracy, reliability, and security. According to the study of [Hong, Jain, & Panakanti \(1999\)](#), the factors similar to previous studies were identified to evaluate any biometric technology are universality, permanence, measurability, uniqueness, accuracy, reliability, and reproducibility.

Few studies also mentioned the disadvantages and challenges involved in Aadhar enabled Direct Benefit Transfer. According to studies of [Khera \(2017\)](#) the maximum damage is caused to the poor and the beneficiaries as all the welfare schemes are linked to Aadhar card.

Aadhar as a tool suffers from challenges like data privacy, ghost accounts, exclusion of genuine beneficiaries and government surveillance issues, and involvement of different levels of government officials ([Bhatia & Jacqueline, 2017](#)). The majority of research papers mentioned that the major challenge is that the customers have been unable to verify their identities because of fingerprint mismatch. This problem arises particularly for aged citizens with fading fingerprints or citizens with medical conditions. Another challenge identified is a hacking and international attack on data as the major challenge, especially using social media networks. This is the reason behind the Indian Supreme Court's recent verdict that no private sector organization can ask for Aadhar card details from residents for personal data validation purposes.

There is a fear of hacking data in residents ([Sethi, 2018](#)). In his study, the researcher raises a valid point that the responsibility of safeguarding the resident's biometric data lies with the Government and cannot be outsourced as per the accountability principle.

The above-mentioned studies about the efficiency of Aadhar and its various challenges reflecting the problem of implementation rather than the very idea of Aadhar as a tool of E-Governance. A study by [Nimesh & Hemchandracharya \(2015\)](#), found that one of the challenges is the lack of proper information and awareness among beneficiaries about Aadhar and its benefits. There is a need for awareness campaigns. [Madabhushi \(2017\)](#) in his study proposed a tough grievance and redressal system for reducing fraud related to Aadhar. [Ayush et.al., \(2017\)](#), advocates the need for an independent third party online auditor as an effective way for privacy protection of Aadhar.

The Objective of the study

An attempt has been made to study the perception of educated residents of India about the efficiency of Aadhar card as a tool for E-Governance.

RESEARCH METHODOLOGY AND RESEARCH METHODS

It is a quantitative research study, which is administered in India with the help of a structured questionnaire to 400 respondents. The sample size is decided based on the study of [Cochran \(1977\)](#) on sample size determination. The objective of the research is to understand the respondent's opinions on Aadhar card as an efficient tool for E-Governance. Based on the past studies four independent variables taken are Facilitation, Timeliness, Reliability, and Concerns to measure the dependent variable, Efficiency of Aadhar card. The efficiency of the E-Governance system means minimizing the time required to record, maintain, and produce the data or information. Timeliness is the ability of the system to speed up the process and generate the required information on time. Reliability is the high standard of accuracy, trust, and reliability of the system such as resistance to breach and damage. The concern is the aspect of safety that is often questioned in the implementation of an information system with large sensitive data. These indicators are measured with the help of 35 items. To investigate the impact of these indicators and to construct the model an e-questionnaire is sent through a link to educated residents of India who resides in India through email and mobile phones.

The respondent's opinions are collected through a well-structured questionnaire by using a five-point Likert scale. The responses rank from 1 (strongly disagree) to 5 (strongly agree). The scope of the study is limited to the educated residents of India. This could be a limitation for this study as the responses are not drawn from the uneducated strata of the economy.

The study has used Exploratory Factor Analysis (EFA) and structural equation modeling (SEM) through the AMOS program to test the hypotheses and further to build the model.

The following four hypotheses are formulated for the present study:

- H1: Facilitation has an impact on the respondent perception of the Efficiency of Aadhar card as a tool for E-Governance.
- H2: Reliability has an impact on the respondent's perception of the Efficiency of Aadhar card as a tool for E-Governance.
- H3: Timeliness has an impact on the respondent perception of the Efficiency of Aadhar card as a tool for E-Governance.
- H4: Concern has an impact on the respondent's perception of the Efficiency of Aadhar card as a tool for E-Governance.

Table 1: List of Factors mentioned in the Survey Instrument

Indicator	Items	Coding
Facilitation	Aadhar Card is required for any transaction with the government	(F1)
	Aadhar card helps to open bank accounts easily	(F2)
	Aadhar card helps to get LPG subsidy directly into a bank account	(F3)
	Linking Aadhar to PAN card made tax filing easy and transparent	(F4)
	Aadhar card helps in procuring "digital life certificates" for pensioners to avoid in-person verification by the bank	(F5)
	Aadhar Card is useful in getting treatment and admission in government hospitals and clinics and medical benefits	(F6)
	Aadhar Card makes it easier and faster to get new passports or renewing old passports	(F7)
	Aadhar can facilitate linking of local ids to population census and education data	(F8)
	Aadhar can facilitate linking of local ids to health care, birth and death records, and immunization records	(F9)
	Aadhar is required for fair property registration	(F10)
Reliability	Aadhar Card ensures that the right people receive the right benefits	(R1)
	Aadhar Card can identify eligible citizens and grant them scholarship benefits/ rozgar yojana and other welfare schemes for unemployed youth	(R2)
	Linking Aadhar to bank accounts and Investments made financial system robust and transparent	(R3)
	Aadhar card helps in eliminating bogus voters	(R4)
	I feel that the Aadhar Card helps to eliminate fake beneficiaries and prevent corruption and frauds in social welfare benefit claims	(R5)
	I feel that Aadhar Cards helps in curbing black money in the country	(R6)

	Aadhar Card integrates information and ensures accessibility of public services across all the regions for balanced regional development and better governance	(R7)
Timeliness	Aadhar card ensures timely pension pay-outs to pensioners	(T1)
	Aadhar card helps in fast and transparent claim submission for provident funds	(T2)
	Aadhar Card is useful for security and intelligence, police verification, and law enforcement for timely action.	(T3)
	Aadhar helps service providers to authenticate the identity of residents electronically in a quick manner	(T4)
	Aadhar Card helps in speeding up the transactions with the government	(T5)
Efficiency	Aadhar Card has made life easier and better for citizens	(EF1)
	Aadhar Card secures citizens identity effectively	(EF2)
	Aadhar Card helps the government to efficiently plan and distribute services	(EF3)
	Aadhar Card helps in smooth distribution and monitoring of pension by the government	(EF4)
	Aadhar Card ensures fairness and transparency in providing jobs for eligible citizens across various social class	(EF5)
	In my opinion Aadhar Card is making service delivery cost-effective and efficient	(EF6)
	Aadhar helps in early detection and warning systems for anomalies in the policies	(EF7)
	Aadhar project helps in increasing digitization of the economy and data analytics	(EF8)
	In my view, Aadhar Card helps in better E-Governance of the country	(EF9)
Concern	Aadhar card may result in the breach of demographic and biometric data privacy	(C1)
	There could be a threat of hacking or insider leaks of confidential and personal data stored in Aadhar database	(C2)
	Misuse of illiteracy of citizens and making fake identity without their knowledge.	(C3)
	Aadhar card may not be able to address the problems which arise due to infiltration in the borders.	(C4)

Source: Factors grouping done by the researchers

ANALYSIS AND FINDINGS

To analyze the data exploratory factor analysis (EFA) is used to determine the dimensions of the study. AMOS was used to confirm the exploratory factor model. Structural equation modeling (SEM) was applied to the data to test hypotheses. SEM methodology is used for estimating and testing several relationships between variables (Byrne, 2001). The dependent variable is taken as Efficiency and independent variables are Facilitation, Reliability, Timeliness, and Concern.

Table 2: Cronbach's Alpha Reliability Test

S No.	Variable	Cronbach's Alpha
1	Facilitation	.940
2	Reliability	.944
3	Timeliness	.918
4	Efficiency	.962
5	Concern	.883

Source: Calculated using SPSS

Table 3: Exploratory Factor Analysis with Loadings and Eigenvalues

Factor	Symbol	Loadings	Variance Explained	Eigenvalues	Other scales
Facilitation	(F1)	.808	53.94	8.77	
	(F2)	.746			
	(F3)	.699			
	(F4)	.607			
	(F5)	.671			
	(F6)	.666			

	(F7)	.713		
	(F8)	.776		
	(F9)	.809		
	(F10)	.681		
	(R1)	.694		
	(R2)	.671		
Reliability	(R3)	.709	7.87	6.30
	(R4)	.719		
	(R5)	.795		
	(R6)	.746		
	(R7)	.719		
	(T1)	.688		
Timeliness	(T2)	.684	5.45	2.93
	(T3)	.724		
	(T4)	.696		
	(T5)	.679		
	(C1)	.732		
	(C2)	.790	2.09	2.97
Concern	(C3)	.735		
	(C4)	.807		
	(EF1)	.760		
	(EF2)	.719		
	(EF3)	.756		
Efficiency	(EF4)	.766	1.86	2.78
	(EF5)	.747		
	(EF6)	.761		
	(EF7)	.672		
	(EF8)	.803		
	(EF9)	.802		

KMO =0.937
 Barlett's Test =15329.87
 Sig =0.000
 Cumulative variance=69.37

Source: Calculated using SPSS AMOS

From the above Table 2, it is noted that all conditions of (EFA) has been achieved (KMO =0.937 > 0.60, Sig=0.000 < 0.05, Cumulative Variance =69.37 > 60). Eigenvalues for every factor is greater than one. Exploratory Factor Analysis (EFA) revealed five dimensions. AMOS program was used to conduct the analysis and to determine the goodness of fit between the hypothesized model and sample data which was collected using a structured questionnaire. Structural Equation Model (SEM) through AMOS was conducted to show the effect of dimensions like Timeliness, Reliability, Facilitation, and Concern (Independent variables) on the Efficiency (Dependent variable) of Aadhar card as an efficient E-Governance tool. Table 3 shows the fit indices of the model in the current study. The results indicate a good fit and the results are in acceptable limits.

Table 4: Exploratory Factor Analysis - Model Fit Indices

Indices	Indices value	Criteria
Chi-Square(p=0.000): χ^2	2519.204	< .05
(Chi-Square/Degrees of freedom: CMIN/DF)	4.66	< 5
(Root Mean Square of Approximation: RMSEA)	.078	< .08
Root Mean Square Residual: RMR)	.093	< .1
(Comparative Fit Index: CFI)	.904	> .9
(Tucker Lewis Index: TLI)	.911	> .9
(Incremental Fit Index: IFI)	.905	> .9
(Normed Fit Index: NFI)	.978	> .9
(Parsimony Normed Fit Index: PNFI)	.706	> .5
(Goodness of fit Index: GFI)	.906	> .9
(Parsimony Goodness of fit Index: PGFI)	.574	> .5

Source: SPSS AMOS

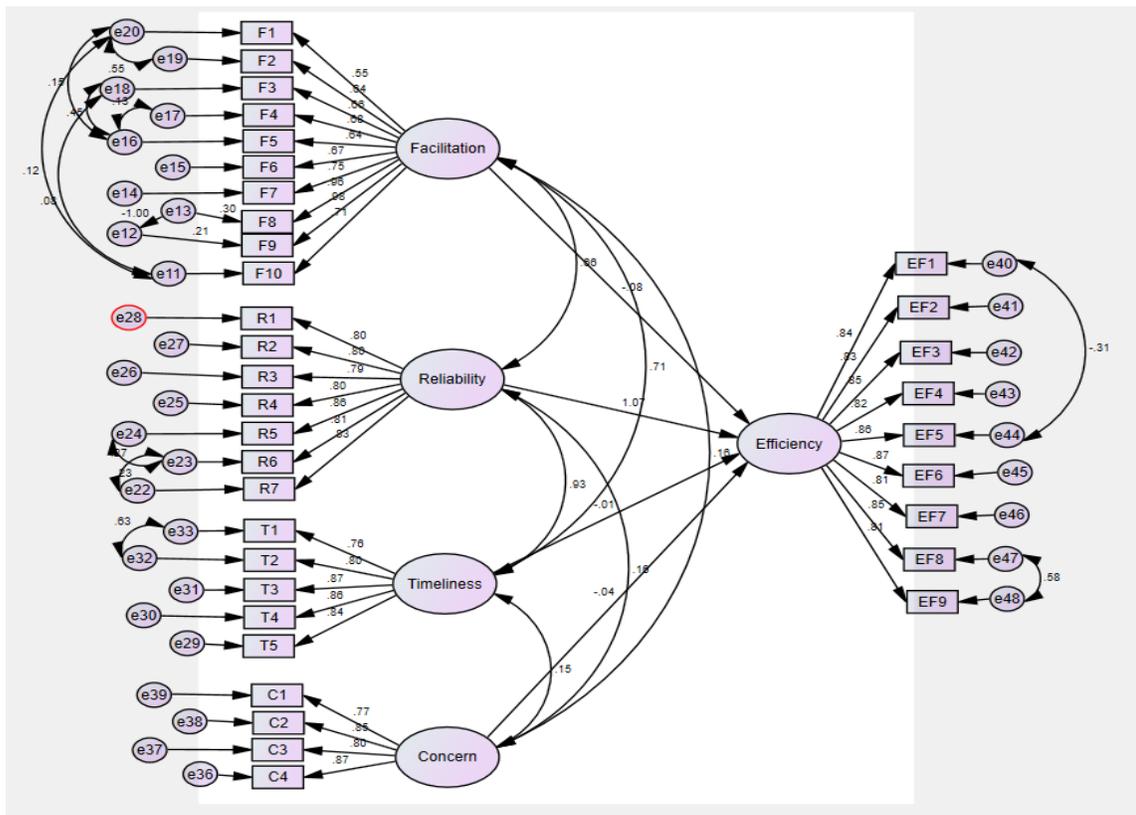


Figure 1: Structural Equation Model with Factor Loadings

Table 5: Hypotheses Testing of the Study

Hypothesis	Structural Path	Estimate	S.E	C.R	P-value	Outcome
(H ₁)	Efficiency ← Facilitation	.092	.033	2.795	.005	Not Supported
(H ₂)	Efficiency ← Reliability	.962	.082	8.989	***	Supported
(H ₃)	Efficiency ← Timeliness	.012	.068	-0.169	.865	Not Supported

(H ₄)	Efficiency Concern	←	-0.046	.023	-1.983	.047	Not Supported
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Notes: * * * = significance >0.001

Source: Calculated using SPSS AMOS

As stated above, the objective of the study is to study the perception of educated residents of India to understand the efficiency of Aadhar card as a tool for E-Governance. Based on the review of the literature, researchers found that most of the existing research reflects multiple aspects, mostly discussing the issues about threats and concerns. During the review, researchers did not find any study on the perception of educated residents of India on Aadhar card as an efficient E-Governance tool. The study backs the limited literature available. A model has been developed using Exploratory Factor Analysis and the hypothesis testing proves that of all the four independent variables taken, Reliability is the only factor influencing Efficiency and is statistically significant.

Reliability as a factor respondents perceive that Aadhar card made financial system robust and transparent, helped in eliminating bogus voters, has made life easier and better for citizens, identifies eligible citizens, and grants them scholarship and other benefits and schemes. [Daya \(2018\)](#), [Mathew & Goswami \(2016\)](#) ensures the right people to receive the right benefits through mechanisms like JAM (Jan Dhan – Aadhar – Mobile) trinity, eliminates fake beneficiaries, and prevents corruption and last but not the least to curb black money in the country.

Aadhar card helps in integrating information and ensuring accessibility of public services across all the regions for balanced regional development and better governance. Aadhar card primarily is seen as their identity by the citizens. The reason behind it is Indian Government has made Aadhar card mandatory for transactions with banks, tax filing, anything to do with government, and daily mundane transactions. It is seen by citizens as a tool for better E-Governance and making their life easy in many ways. The government can efficiently plan and distribute services using Aadhar card as a tool to identify the right beneficiaries. Aadhar card project also helped in bringing in digitization into the country. It is observed by many researchers in the past that the rollover benefit of digitization is reducing the service delivery cost.

Finally, in detecting anomalies in the policies which are according to citizens, will take a longer time to see the light of the day. Discussing the efficiency without considering the concerns gives only a one-sided picture. The efficiency of the Aadhar card also depends on the concerns which citizens have and how it is addressed by the government. The biggest concern of citizens is that Aadhar is unable to address the problems which arise due to infiltration in the borders. The second biggest concern citizens have is about the threat of hacking or insider leaks of confidential personal data stored in the Aadhar database. The Indian Government has made Aadhar mandatory for all transactions. Citizens are worried about the safety and security of how the personal data linked up with Aadhar cards of theirs is used. As per the research conducted by [Wayman et al., \(2005\)](#) a biometric system can enhance user convenience and increase security but is vulnerable to threats. Intrusion Detection System (IDS) which is an emerging technology can be used to plan foolproof biometric security techniques. This security system needs the effective use of Artificial Intelligence. The third biggest concern is the misuse of the illiteracy of citizens and making fake identity. India is the second-largest populated country and at least 10% of the Indian population is illiterates (UNESCO, 2018). The view of government is that every citizen should have an identity and should be included in the formal system financially and economically. But this is a burden for citizens as Aadhar card has become a very important document in day to day mundane activities like MNREGA works for eligible beneficiaries too ([Aggarwal, 2016](#)). This has also become a concern in the issue duplicates, in a study by [Vergese \(2016\)](#), [Vergese & Pranesh \(2016\)](#), mentioned that the expected proportion of duplicates to India's population of 1.2 billion is far too high.

CONCLUSION AND SUGGESTIONS

The study is an attempt to understand the perceptions of educated residents about the Aadhar card as an efficient tool for E-Governance. A questionnaire is administered with a sample size of 400 on four factors like Facilitation, Reliability, Timeliness, and Concern and their impact on Efficiency. To analyze the data of this study exploratory factor analysis (EFA) is used. AMOS was used to confirm the exploratory factor. Structural equation modeling (SEM) was applied to the data to test hypotheses. The outcomes from the study will help to understand the benefits and challenges of Aadhar from the perspective of educated beneficiaries. The outcomes of the study have emphasized the role of reliability as a significant determinant to impact the efficiency of Aadhar as a tool for E-Governance. It implies that the Aadhar based facilities are numerous. The safety and privacy of personal data stored in Aadhar is a matter of concern according to the resident's perception but is not necessarily a hurdle when the systems and implementation process are given utmost importance.

The review of the literature has indicated that there are issues and challenges along with benefits. It has highlighted the importance of effective controls and the role of Artificial Intelligence for data pilferages and misuse of Aadhar related benefits.



The areas where Aadhar needs to be leveraged and to be made as an efficient tool for E-Governance are:

- There should be strategic planning in the form of preparedness of various stakeholders. There should be a strict vigilance on insider leaks of personal and confidential Aadhar based data.
- An independent third party auditor is required to have a control on data privacy which is effective and low-cost audit implementation
- More initiatives like offline apps to protect data privacy via QR codes and paperless KYC are to be implemented ([Rajeev & Sidhartha, 2018](#)).
- Data analytics to collect feedback from various segments of society such as beneficiaries, the public, and other internal stakeholders to identify issues and concerns for continuous improvement.
- There need to be continuous checks and balances at every level to control fake identities and impersonation of illiterates.
- To avoid technological issues there needs to be continuous updating of technology and the awareness of it needs to be created to all relevant stakeholders.
- Comparing with the other alternative biometric tools which are in practice before adopting Aadhar as the better tool, especially for the Public Distribution System kind of facilities ([Rakesh, Sarang, & Sripad, 2019](#)).

SCOPE FOR FUTURE RESEARCH

An attempt has been made to understand the perception of educated respondents of India on Aadhar as an effective tool for E-Governance. The researchers felt the need to widen the scope of the current research for future studies. The perception of lower strata of society who are the beneficiaries of social welfare programs that are linked to Aadhar based DBT needs to be researched to understand the issues relevant from their perspective. Linking Aadhar with social media accounts need to be carefully contemplated and can also be included in future works on Aadhar card.

CO-AUTHORS CONTRIBUTION

The corresponding author and the second author has contributed equally to the paper. In specific the corresponding author contributed towards the development of the questionnaire, conceptualization, developing the model, and interpreting the results. The second author was involved in the review of past literature, developing the questionnaire, collecting data and interpretation, and giving conclusions and suggestions.

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