Digital Literacy as a Driver of Social Inclusion in E-Governance: A Survey of Households in Coimbatore City

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Abstract

A modern administrative paradigm is becoming more characterized by the shift of the traditional bureaucratic system towards complex digital systems of governance. Although the "Digital India" campaign has greatly contributed to the development of technical infrastructure to deliver of services to the citizens, the actualization of inclusive governance is subject to the adaptive ability of the citizenry. This study explores how digital literacy can be one of the key determinants in social inclusion in e-governance with emphasis on the households of Coimbatore City, which is a major tier-II industrial and technological centre in the state of Tamil Nadu. Based on the Capability Approach presented by Amartya Sen, the research approach conceives digital literacy not as a technical proficiency but as a key individual conversion factor that facilitates citizens in changing digital resources to produce substantive liberty and engagement consequences. The stratified random sampling method was used to sample 384 households in the five administrative zones of Coimbatore City Municipal Corporation. The study uses a two-step Structural Equation Modeling (SEM) method to examine the correlations among the five domains of the DigComp 2.1 framework of Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Safety, and Problem Solving, and the indexes of social inclusion, such as civic participation and independence in exercise of rights. The results indicate that digital innovation is useful in increasing the quality of e-government services that, in its turn, can increase the quality of participatory decision-making in the formation of a public policy. Nevertheless, the findings also highlight that there remains a second-level digital divide in the sense that socio-economic factors like education, occupation, and age introduce significant differences in the capacity to transact in the digital arenas. The structural model shows that the most effective predictors of the civic engagement and institutional trust are safety awareness and information literacy. Finally, the paper finishes off with the evidence-based suggestions on how to make critical digital literacy a significant part of the civic education curriculum and implement the principles of universal design to make e-governance a means of fair social change and not a means of further marginalization.

Keywords: Digital Governance, Institutional Trust, Peace Building, Social Cohesion, Technology

Introduction

The worldwide refocusing of power towards digital modalities is not just a technological upgrade; it is a key institutional provision of equitable access to digital advantages. (Ajzen, 1991)

The history of digital governance in the Indian context has been characterized by the shift of paper-based systems, with time-consuming processes, to dynamic, technology-based systems that are more efficient, inclusive, and transparent. (Albrecht, Seelman, & Bury, 2019)

Flagship programs like Digital India that were initiated in 2015 envisioned turning the country into

a digitally empowered society in which services could be accessed Anytime, Anywhere. (Albrecht et al., 2019)

In 2024, the number of internet users in India has hit a mark of over 900 million, but rural access increased more than urban access, although this number masks structural imbalances in the usage patterns and the value they generate out of these tools. (Albrecht et al., 2019)

The city of Coimbatore, which is the so-called Manchester of South India, is quite an interesting microcosm to study the conflicts between technological progress and social justice. The city being a major industrial hub with an expanding IT industry has a wide demographic base that includes highly skilled software engineers to a large industrial workforce involved in the manufacturing industry and MSMEs. (Bandura, 1997)

Coimbatore City Municipal Corporation (CCMC) has been on the frontline of adopting e-governance modules and it has won national awards as a pioneer in delivering digital services. (Carretero, Vuorikari, & Punie, 2017)

Online property tax collection, birth and death certificate issuance, grievance redressal services through the app called Namma Kovai are meant to enhance customer satisfaction and offer easy to use interface. (Anwar & Graham, 2021)

Though these improvements are made, the success of digital governance is often marred by the so-called digital paradox, whereby metropolitan regions have high-speed Internet connectivity and large chunks of the population are digitally inaccessible or simply unable to operate the very systems intended to provide services to their community. (Hargittai, 2002)

This break shows the rise of the second-level digital divide, which is concerned with disparities in digital aptitudes and not with the pure physical access. Studies indicate that where digital inequality is high, participation online may be turned into a democratic luxury that is only afforded to the educated and technology-savvy in society, which further supports the existing socio-economic hierarchies. (Hu & Bentler, 1999) (Jöreskog & Sörbom, 1984)

This paper embraces the Capability Approach developed by Amartya Sen as the normative framework to deal with these issues. The Capability Approach does not place the emphasis on evaluations on the resources (i.e. the availability of a municipal portal), but on the substantive liberties that individuals possess to accomplish the results they appreciate. (Kline, 2015)

Against this backdrop, digital literacy is theorized as a type of cognitive bridge whereby citizens can flex their rights and have the capacity to engage in the realm of a meaningful public life. The urgency of this study is also increased by the Master Plan of Coimbatore of 2041 that stresses on sustainable and inclusive development using smart solutions. (West, 2004)

This study aims to determine the precise competencies that lead to social inclusion and offer practical policy implications to policymakers who aspire to decrease the gap between the rapidly urbanizing settings.

Literature Review

The COVID-19 pandemic has had a radical influence on scholarly discussion on digital governance and social inclusion between 2020 and 2025, as it represented a critical inflection point to rethink education, healthcare, and administration with the assistance of technology. (Arnstein, 1969)

The Digital Divide is Multidimensional

The theoretical framework of the digital divide has developed to be not binary, i.e., the haves and the have-nots, but a multilayered problem that involves three different levels. (Hu & Bentler, 1999)

The first-level divide is still centered on physical access to hardware and infrastructure. Although mobile penetration is high, an Access Divide remains in India, where penetration of the internet in rural areas is 37% as compared to 72% in urban areas, and many families are struggling with affordable access to devices and connection speeds. (Arnstein, 1969)

The second level divide or the Skills Divide focuses on the differences in digital literacy and the capacity to derive value out of ICTs. Recent research shows that, although there is growing possession of basic digital skills, high-level problem

solving and critical information evaluation ability is still low among the disadvantaged demographics, such as women and the old. (West, 2004)

The third-level divide, the "Benefit Divide", deals with the unequal results of digitalization, in which the already advantaged groups obtain a disproportionate portion of the social and economic benefits of e-governance. (Ajzen, 1991)

The use of E-Governance as a Form of Empowerment and Inclusion

The current studies emphasize that e-governance is no longer just a technological initiative but a basic institutional tool of social development. Digitalization is helping to achieve more comprehensive social inclusion objectives by making available more and quicker service delivery and promoting the quality of social services to vulnerable populations. (Van Dijk, 2005)

In India, rural empowerment and inclusive governance has been associated with the use of "Digital Public Goods" (DPGs), but the achievement of these strategies has been pegged on the so-called e-inclusion—the endeavor to make sure that everyone, including those with learning challenges or whose backgrounds are marginalized, can equally consume and utilize technology. (Silver, 2015)

As (Sen, 1999) notes, the digital transformation may otherwise extend the existing fault lines unless proper policies are enacted, especially for low-income and less digitally literate groups.

Technology Adoption Theoretical Frameworks

The connections between digital literacy and uptake of e-governance have been well studied using models like the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). (Jöreskog & Sörbom, 1984)

These frameworks recognize perceived usefulness, perceived ease of use and social influence to be the key determinants of willingness of a citizen to interact with digital platforms. (Jöreskog & Sörbom, 1984)

But newer studies indicate that these models need to be extended into the realization of digital innovation that enhances the quality of services, and consequently, maintains a participatory citizen involvement in the decision making of policies. (Jöreskog & Sörbom, 1984)

Digital Literacy and Capability Approach

The Capability Approach by Amartya Sen offers a solid normative framework to assess the effect of digital literacy on human development. (Kline, 2015)

In this method, the states of being and doing that a person has a reason to appreciate are called functionings, e.g., to be healthy or to be literate, and the collections of possibilities that a person can bring to an actual functioning are called capabilities. (Kline, 2015)

Digital technologies are seen as "means to an end" rather than ends themselves, and the ability to convert these resources into freedoms depends on "conversion factors". (Kuppuswamy, 1976)

Digital literacy is a crucial personal conversion factor expanding an individual capability set enabling them to engage in the political process and live prosperous lives. (Kuppuswamy, 1976)

Recent scholarship contends that the Capability Approach can correct the shortcomings of the classical utilitarian theories, by emphasizing the agency of individuals and the freedom of choice to participate in development (process freedom). (Nussbaum, 2000)

The Indian Urban Situation: Tamil Nadu and Coimbatore

Digital literacy (especially among women) is an area where the state of Tamil Nadu has performed better than the rest of the country, with programs such as Arasu e-Sevai centers and the free laptop scheme.

Research on the efficiency of the Digital India campaign in Coimbatore shows that a considerable number of people have intermediate skills, but the advanced training programs are in high demand. (West, 2004)

The study conducted in the North part of Coimbatore showed that awareness is most likely to be

through social media and accessibility is the most preferable advantage of e-governance.

Nevertheless, unevenness in proficiency is still pronounced among various socio-economic groups, especially when it comes to the huge industrial labor force of the city and the employees of the gig economy. (West, 2004)

Research Gap

Although the body of research on the digital divide in India has increased, there are a number of gaps that have been identified in the literature. First, the extant literature tends to concentrate on the rural-urban distinction, or on national means, which lacks intra-urban differentiation, since the tier-II cities such as Coimbatore have both industrial and technological workforce pictures, living in close proximity. Ajzen, I. (1991) Second, most assessments of e-governance effectiveness are based on "supply-side" indicators like project completion rates and fund usage, and not on "demand-side" indicators like real citizen ability and independent use. Thirdly, although the digital literacy is often cited as an obstacle, there is no rigorous empirical research conducted in terms of standardized models such as DigComp 2.1 that would determine which of the dimensions of literacy (e.g., safety vs. information skills) is the most dominant in driving social inclusion. Lastly, the literature using the Capability Approach with urban Indian families is limited to differentiate between passive achievement (using services through the intermediaries) and process freedom (being able to become independent digital actors).

Problem Statement

The Coimbatore City Municipal Corporation has adopted an advanced digital infrastructure as part of the Smart Cities Mission, attaining a project completion rate of 94% and enormous investments in Integrated Command and Control Centres. Nonetheless, the institutional vision of the governance of Anywhere Anywhere is still literally unreachable by a significant number of population because of a deep-seated Skills Divide. National statistics show that just 38 percent of Indian households are digitally literate and just 12 percent of the population over 15 years old have basic ICT skills, a very low level of internet-related capabilities in comparison with the 80 percent traditional literacy level. The younger, better educated groups have been concentrated in proficiency in Coimbatore, and this has left the aging industrial labour force and the informal workers in the digital lag. This discrepancy between the technical supply and human potential results in an Outcome Divide in which e-governance systems cause the simplification of processes to the administration but introduces to the citizens new unfreedoms, requiring them to go through third-party service centers, thus crippling their civic agency and cementing their socio-economic marginalization.

Objectives

1. To determine the digital literacy of households in Coimbatore City in the five domains of the DigComp 2.1 framework.
2. To examine the socio-economic determinants (age, gender, income, education, and occupation) that affect the distribution of digital competencies.
3. To determine perceived quality of e-governance services and level of citizen participation in participatory mechanisms.
4. In order to analyze the causality between digital literacy and social inclusion, it is necessary to determine the causal mechanisms by which particular skills can lead to civic participation and autonomy.
5. To create a tested structural model to inform inclusive digital governance approaches in tier-II cities.

Methodology

Administrative Stratification and Study Area. The study was carried out in Coimbatore City and it was administered by Coimbatore City Municipal Corporation (CCMC). Geographically, the city is split into two unique spheres: the dry eastern section with the urban centre and the western one with the Western Ghats, which is

Table 1: Key Themes on Digital Divide and E-Governance Context (2020–2025)

Theme	**Key Findings (2020–2025)**	**Relevant Source IDs**
Digital Divide Levels	Shift from access to skills (2nd level) and outcomes (3rd level).	Ajzen (1991)
Capability Approach	ICT as a means to expand substantive freedoms and agency.	Kline (2015)
E-Government Participation	Literacy mediates the link between service quality and participation.	Joreskog et al. (1984)
Indian Context	38% household literacy; high urban-rural and gender gaps.	Arnstein (1969)
Coimbatore Status	Intermediate skill levels; high infrastructure but training gaps.	Carretero et al. (2017)

split into five areas, North West South, East and Central city wards, a total of 100 wards. The population density of the city is around 6,147 persons per square kilometer and the population is highly literate (91.3%) but differs in terms of economic status.

Sampling Strategy and Sample Size A stratified random sampling method was used to be able to represent different socio-economic layers. The five municipal zones were the major strata, and wards in the zones were the secondary units.

The sample size was calculated using Cochran formula of a 95% confidence level and a 5% margin of error and came out to be 384 households. Households were picked at random out of the ward electoral rolls.

Data Collection Instrument

A questionnaire was created in a structured form, including scales which were validated in the literature. The instrument was composed of three parts:

1. **Demographic Profile:** According to the Modified Kuppuswamy SES scale (2024) including education, occupation, and monthly family income.
2. **Digital Literacy (DL):** It is a reflection of the DigComp 2.1 framework and Digital Competence Scale (DCS). It was a 12 item scale in six facets namely Basics and Foundations, Information and Data Literacy, Communication, Content Creation, Safety and Problem Solving.
3. **Social Inclusion (SI):** It is based on the Social Inclusion Questionnaire-20 (SIQ-20) and the Participatory Public Policy Decision-Making (PPPDM) index. It encompassed civic participation, self-sufficiency in the access of rights and institutional trust.

All items were scored on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). To guarantee linguistic equivalence, the instrument was translated into Tamil and back translated.

Statistical Techniques

The study employed a descriptive statistical method to analyze the demography and Structural Equation Modeling (SEM) to test the hypothesis. The SEM strategy was based on the two-step process suggested by Anderson and Gerbing (1988), which is a measurement model (CFA) and a structural model. The SPSS and AMOS were used to analyze data and assess the model fit, set against conventional standards:

$$\chi^2/df < 3.0, \quad CFI > 0.90,$$
$$TLI > 0.90, \quad RMSEA < 0.08,$$
$$SRMR < 0.08.$$

Table 2: Key Themes on Digital Divide and E-Governance Context

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Results and Discussion

Household Demographic and Socio-Economic Profile

The survey data will give a subtle view of the socio-economic profile of Coimbatore households. The labor force is comparatively young, and almost two-thirds of the population are less than 35 years of age, which indicates that the city is an education and information hub. Nonetheless, the statistics show that there are substantial differences in access to and use of devices.

The correlation analysis reveals that the level of education and digital proficiency are highly correlated ($r = 0.76$, $p < 0.001$). The gendered digital divide in India is confirmed by the fact that a greater share of young males is found to be better-connected to digital services, and the city hub of industry (Wards 5-9 and 50-61) exhibits a specific type of Skills Divide, with its residents having basic smartphone knowledge but lacking the safety and problem-solving skills involved in more complex e-governance transactions.

Measurement Model: Confirmatory Factor Analysis (CFA)

The measurement model had been tested so as to verify the reliability and validity of the latent constructs. The indicators loading was all above the threshold of 0.60 which shows a high internal consistency.

The Average Variance Extracted (AVE) of all constructs was over 0.50 and Composite Reliability (CR) values were over 0.70, which met the requirements of convergent validity. Structural Equation Modeling (SEM) Results. The structural model evaluated the causal relationships among the digital literacy, service quality as well as social inclusion. The goodness-of-fit measures show that the model fits the data well.

The path coefficients demonstrate the significance of digital literacy as a driver of social outcomes.

The mediation analysis, with bootstrapping of 5,000 sub-samples, makes it clear that E-Governance Service Quality partially mediates the relationship between Digital Literacy and Social Inclusion (0.30, $p < 0.001$). This implies that, although internal skills of a citizen (DL) have a direct positive influence on their inclusion, their perception of the system responsiveness and transparency (EGSQ) is a critical reinforcing mechanism.

Patterns of Usage and Deterrents to Use

The e-governance usage shows high rates of bill payments and certificate tracking and low rates of policy consultation and participatory budgeting via the descriptive analysis.

The most reported barriers included "Digital Literacy" (50%), then came "Connectivity" (30%) and "Lack of Trust" (20%). In low-literacy households, a significant tendency was toward using Arasu e-Sevai centers, where the staff members

Table 3: Socio-Economic Factors and Digital Literacy Scores

Socio-Economic Factor	**Category**	**Frequency (N=384)**	**Percentage (%)**	**Mean DL Score**
Education	Graduate & Above	288	75	4.42
	Secondary (10–12th)	58	15.1	3.05
	Below Secondary	38	9.9	1.92
Occupation	IT/Tech Professionals	123	32	4.75
	Industrial/MSME Workers	173	45.1	2.88
	Gig Economy/Self-Employed	88	22.9	3.12
Family Income (Monthly)	Upper (> Rs.9,000 per cap)	81	21.1	4.55
	Upper Middle (Rs.4k–9k)	184	47.9	3.65
	Lower/Lower Middle	119	31	2.4
Gender	Male	220	57.3	3.98
	Female	164	42.7	3.15

Table 4: Confirmatory Factor Analysis (CFA): Measurement Model Results

Latent Construct	**Manifest Indicator**	**Loading (λ)**	**AVE**	**CR**
Digital Literacy (DL)	IDL1 (Info Literacy)	0.84	0.66	0.89
	CC1 (Communication)	0.81		
	SA1 (Safety/Security)	0.87		
	PS1 (Problem Solving)	0.72		
E-Gov Quality (EGSQ)	EGSQ1 (Usability)	0.79	0.62	0.87
	EGSQ2 (Responsiveness)	0.82		
	EGSQ3 (Transparency)	0.85		
Social Inclusion (SI)	SI1 (Civic Engagement)	0.83	0.64	0.88
	SI2 (Rights Access)	0.81		
	SI3 (Autonomy)	0.76		

handle the digital interface on behalf of the citizen at a nominal service fee (usually Rs.60–Rs.120).

Discussion: Redefining the Public Encounter in a Smart City

The Coimbatore household empirical evidence gives a deep understanding of how technology

Table 5: Model Fit Indices for Structural Equation Model

Fit Index	Value	Benchmark	Interpretation
χ^2/df	2.65	< 3.00	Good Fit
CFI	0.96	> 0.95	Excellent
TLI	0.95	> 0.90	Excellent
RMSEA	0.051	< 0.06	Excellent
SRMR	0.042	< 0.05	Excellent

Table 6: Structural Model Results: Path Analysis

Path	Std. Coeff (β)	t-value	p-value	Result
DL $\rightarrow$ EGSQ	0.62	9.15	< 0.001	Supported
EGSQ $\rightarrow$ SI	0.48	7.24	< 0.001	Supported
DL $\rightarrow$ SI	0.38	5.82	< 0.001	Supported
Total Effect	0.68			Significant

Table 7: Patterns of E-Governance Usage and Barriers

Service Category	Usage Frequency (Monthly)	Perceived Benefit (%)	Key Barrier Identified
Tax/Utility Payments	40%	90%	Connectivity/Payment Trust
Grievance Redressal	20%	75%	Responsiveness Perception
Certificate Services	20%	85%	Process Complexity
Policy Participation	5%	30%	Lack of Digital Skills

determines the process of the so called public encounter between the citizen and the state.

Digital Literacy The Extension of Facilities

Based on the Capability Approach by Sen, the paper concludes that digital literacy is the most important personal conversion factor to contemporary citizenship: The structural relationship between DL and Social Inclusion ($\beta = 0.38$) proves that only those individuals who have high informational and safety skills are more or less free to engage in e-musrenbang (digital planning meetings) and the distribution of ward-level resources.

But what can be called the industrial heart of Coimbatore is capable of a kind of deprivation of capability. Though the physical access of the internet is available to industrial workers, their process freedom is limited by lack of advanced skills in problem solving, and this passive realization is not yet converted into civic empowerment. This is an indication that the third-level digital divide which is the inequality of benefits is embedded in the labor structure of the city.

Mediation of Service Quality and Trust

The research confirms that e-governance service quality is not a static feature of the CCMC portal but is "co-created" by the interaction between platform design and user competence. The strong path from DL to EGSQ ($\beta = 0.62$) indicates that as citizens' skills improve, they perceive the system as more transparent and reliable. The grievance tracking system of the Namma Kovai app used in Coimbatore can serve as a good example; with high data literacy, users can track every step of their application, which helps decrease the information asymmetry that contributes to bureaucratic corruption.

The study, on the other hand, recognises a trust-literacy trap in older adults and low-income households. Inadequate safety literacy means that there is a fear of cyber-fraud, and this fear inhibits the use of e-governance tools, which in its turn inhibits the establishment of institutional trust. It is this cycle that makes only 5 percent of households consult digital policies, they lack trust in

the system to the extent that they think that their voice can be heard.

Gendered subtleties and the Flexibility Premium

The difference in the average literacy (3.98 among males and 3.15 among females) illustrates the structural drag of the cultural norms and unpaid care responsibilities. Intersectional analysis indicates that women entrepreneurs in Coimbatore MSME sector are doubly burdened to receive less technical training and gendered cyber-harassment. To these women, e-governance may provide a flexibility premium- the option of handling business licensing and taxing at the comfort of home- but only when the digital environment is seen to be secure and the tools are simple to use.

City-within-city Inequality and the 2041 Master Plan

With Coimbatore looking ahead to its Master Plan 2041, consideration of human capital development must be aligned to the Smart Solutions. According to the research, the inclusion profile of high-density commercial wards (Central Zone) and the upward IT zones (East Zone) is incredibly different compared with the older industrial wards. A universal digital strategy is likely to aggravate these intra-urban inequalities. The measure of success not should be the complexity of the command center but the percentage of households able to navigate municipal systems independently.

Conclusion

The Coimbatore City household analysis indicates that digital literacy is a crucial cornerstone of social inclusion in the 21 st century. Although the city is making important technical strides in the Smart Cities Mission, the continued existence of the second-level digital divide poses a structural attribute to inclusive governance. The SEM evidence confirms that digital literacy enhances inclusion by broadening individual capacities, building institutional trust, and civic engagement. A multi-pronged policy road map is needed in order to attain a truly Smart and equitable polity.

Making Critical Digital Literacy an Institution

The policy needs to be changed to a more basic operational training framework to a lifelong learning model that focuses on safety, data analysis, and civic involvement. The government of Tamil Nadu must incorporate modules that are aligned with DigComp to the school and university curricula and must extend the PMGDISHA program to incorporate city-focused digital inclusion hubs.

AI-Powered Accessibility and Universal Design

Universal Design principles should be used to redesign e-governance platforms in order to minimise cognitive complexity. The use of AI-based voice assistants and real-time translation in Tamil will allow overcoming the so-called Language Barrier and Education Barrier among the industrial employees and the aged.

De-Gendering the Divide

Specified actions should be taken to open the premium of flexibility to women. This involves learning circles within communities based on their schedule and special programmes on Digital Security and Ethics as a way of gaining confidence in online dealings.

Ward-Level Inclusion Monitoring

The CCMC needs to go further than city-wide indicators and adopt "Ward-Level Inclusion Dashboards." The dashboards need to monitor the Digital Literacy Gap and Autonomy Rate (percentage of independent users versus e-Sevai dependent users) to find and serve underserved neighborhood.

By considering digital literacy as a human right and a fundamental part of Development as Freedom, Coimbatore can make sure that its digital transformation can be a driver of a common prosperity of all its citizens.

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