

Two-Day National Conference on

"GST Reforms: Challenges, Opportunities, and Socio-Economic Effects in Telangana State"
on 09th & 10th June 2026

**CMR TECHNICAL CAMPUS**

Department of MBA

UGC Autonomous, Approved by AICTE, New Delhi & JNTU Hyderabad

Kandlakoya (V), Medchal, Hyderabad – 501401



Bridging the Digital Divide: Technology-Driven Governance and e-Invoicing Readiness in Andhra Pradesh and Telangana

Dr P Sravan Kumar Asst Professor (A), JNTUA School of Management Studies, JNT University

Anantapur, dr.psravan@gmail.com

Dr.SARIKA.G Assistant professor, Department OF MBA Annamacharya Institute of Technology and
Sciences Autonomous Kadapa sarika.aitsk@gmail.com

ABSTRACT

The Goods and Services Tax (GST) in India is one of the biggest fiscal-technology shifts of the 21st century and the Goods and Services Tax Network (GSTN) essentially acts as the digital backbone for registering, filing returns and – since October 2020 – e-invoice. This paper will explore the preparedness of two southern states of India, Andhra Pradesh (AP), and Telangana, for technology-based governance through GFs in this backdrop, GSTN and the phased implementation of e-invoicing. This study is of the explanatory design type using secondary data from the GST Council, the Press Information Bureau (PIB), the Telecom Regulatory Authority of India (TRAI) and state reports on ICT missions, and a structured survey of 198 GST-registered taxpayers in the two states, supplemented by the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). Based on the results, it is observed that e-invoicing readiness is not even across the States and UTs, with Telangana having capacity gaps at 13 percent year-on-year and AP at 16 percent year-on-year, but micro and small enterprises (MSE) and the rural taxpayers have been adversely impacted by their combined capacity gaps. Perceived ease of use appears to be tied up with the more mature T-Fiber backbone and the T-Hub ecosystem in Telangana and AP's compliance monitoring with artificial intelligence and the FiberNet scheme is the narrowing gap that is yet to close. The study recommends the following policy measures: (i) Introduce a tiered Goods and Services Tax Suvidha Provider (GSP)/Application Service Provider (ASP) subsidy for MSEs, (ii) make the academic institutions part of the state-led partnerships for capacity building, (iii) make the condition that the taxpayers' IRP should be in vernacular languages, and (iv) introduce a set of standardized readiness dashboards. The paper aims to address

the conference sub-theme on ' GSTN and technology adoption capacity gaps' in an empirically grounded fashion and by providing a state level comparative analysis perspective.

Keywords: *e-invoicing, GSTN, digital governance, technology adoption, digital divide, Andhra Pradesh, Telangana, Technology Acceptance Model*

1. Introduction

Fiscal structure ultimately is only as strong as its information technology backbone. The implementation of Goods and Services Tax (GST) in India in July 2017 was a tax consolidation that also involved a ground-breaking governance-technology initiative. The Goods and Services Tax Network (GSTN), an IT-based non-profit, non-governmental entity, was conceptualized to accommodate the workload of registering, filing do's and dos, payment, refund, e-way bill and e-invoicing of expected 14 million registered taxpayers (GSTN, 2024). The architecture of the system is multi-layered with API support, enabling Goods and Services Tax Suvidha Providers (GSPs) and Application Service Providers (ASPs) to serve as intermediaries between taxpayer ERP systems and the central GST portal (Avalara, 2024). In this design, e-invoicing, which is to be implemented using the Invoice Registration Portal (IRP), turned out to be the most impactful Continuous Transaction Control (CTC) system implemented by Indian government.

Under the GST framework, it mandated that specified taxpayers submit data about their Business-to-Business (B2B) invoice to the IRP, which will provide them with a cryptographically signed Invoice Reference Number (IRN) and a Quick Response (QR) code for the same document, making it legally enforceable for GST purposes (Avalara, 2023). The mandate took a voluntary form starting from January 2020 and became compulsory for businesses beginning from October 2020, and gradually for businesses with annual turnover exceeding INR 5 crore till August 2023 (as per EDICOM (2024); Storecove (2024)). The staged introduction was clearly the deliberate intention to give smaller companies time to upgrade their accounting system, train staff and integrate GSP/ASP-type intermediaries, as a tacit concession that there are gaps in capacity and that they have an impact on compliance outcomes.

In this context, the present study looks into the two States termed Andhra Pradesh (AP) and Telangana, which came into existence due to bifurcation of the erstwhile Andhra Pradesh in the year of June 2014. In both the states, investments have been made in digital governance in the form of Meeseva for citizen services by the AP government, the AP FiberNet (FiberGrid) broadband network, the T App Folio mobile application for citizens and the use of artificial intelligence, blockchain, and Internet of Things (IoT) in administrative processes by the Telangana government (Balakrishna, 2021; Government of Andhra Pradesh, 2024; Shankar Kumar, 2025; T Hub, 2024). However, the two states exhibit distinct trends in GST revenue growth, taxpayer complaints and the willingness of businesses that are small and medium size (SMEs) to participate in the e-invoicing process, even though their per-capita income is the same.

It comes under the conference sub-theme - GSTN and capacity building of technology adoption. It states that "comprehensibility readiness" is not just about legal requirements and platforms, but about a nexus of state-level governance capabilities that include: reach of broadband network, digital-literacy programmes, AI-supported compliance monitoring, and maturity of intermediated services networks. The study compares AP and Telangana on these dimensions to make sense of how two states with high IT ambitions might create distinct compliance perspectives per sustainability criterion in the face of a national mandate. The argument underlines the fact that the digital divide exists in several different dimensions: the household level, the intermediary dimension and the enterprise level; and that the challenges and policy implications differ with each of these dimensions.

2. Need for the Study and Objectives

While a large amount of literature has looked into the technical design of the GSTN and the macroeconomic impact of GST (Rampure & Doddamani, 2021; EDICOM, 2024), relatively little work has been done from a sub-national, comparative angle to assess e-invoicing readiness. The available studies either consider India as a single policy-world or examine only larger industrial states like Maharashtra, Gujarat and Tamilnadu. Despite their policy activism in digital governance and higher than average performance in collection of GST revenues, the southern states of AP, Telangana are under-represented in the empirical literature. This study will fill that gap by focusing the inquiry on two states that have meaningful differences in their digital-governance paths since 2014 and share administrative DNA at the same time.

The second one is the gradual reduction of the e-invoicing threshold turnover. With the mandate rolling out to companies with turnover of INR 5 crore to INR 10 crore and then to smaller traders, the compliance requirements fall on the shoulders of MSEs who might not be able to allocate finance officers, ERP systems or even internet connectivity. The RIS (2023) report on MSME digitalisation in India reveals that there are many challenges in the path of MSMEs digitalisation, including financial issues, skill lack, and lack of awareness. A Vertex Inc. (2024) study reveals that 55 per cent of companies are at least worrying about costs when implementing e-invoicing. These enterprise-level limitations combine with state-level investments in infrastructure and government policies, creating a patchwork quilt of readiness that requires systematic analysis.

Thirdly, the GST Council's recent focus on data-driven compliance, as witnessed through the implementation of AI-based analytics by the AP Commercial Taxes Department (The Hindu, 2026), does present a few issues on distributional fairness of compliance. Where readiness gaps are not evenly distributed among firms by size and/or geography, AI-enabled enforcement could also lead to an increased compliance burden for the least ready segment, impacting tax equity and the ease of doing business. It is important for policy makers, industry and academia to understand these dynamics.

Based on the above, the following specific objectives of the study are set:

- (i) To map the digital governance infrastructure of AP and Telangana as it relates to GSTN related compliance;
- (iii) to conduct a comprehensive evaluation of the readiness of the Sarsikonda area for e-invoicing on six parameters of the e-invoicing ecosystem – digital infrastructure, utilization of GSTN API ecosystem, taxpayer digital literacy, readiness of MSMEs, grievance redress maturity and compliance enforcement; and
- (iii) to find and describe differences in readiness based on firm size, geographical location, intermediary ecosystem; and
- (iv) To come up with policy suggestions for the reduction of e-invoicing capability gaps in the two states and, consequently, in the similar states of India.

3. Hypothesis

The study is guided by four inter-related hypotheses which are based on the Technology Acceptance Model (Davis, 1989), the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003), and the technology-organisation-environment (TOE) framework (Tornatzky & Fleischer, 1990). The hypotheses are formulated in directional form to enable the testing of the hypotheses empirically.

States with more advanced digital-governance infrastructure (based on broadband reach, depth of e-services and AI-enabled compliance tools) have significantly higher e-invoicing readiness scores than states with less advanced infrastructure.

After adjusting for state of registration, perceived ease of use and perceived usefulness of e-invoicing is significantly lower for Micro and Small Enterprises (MSEs) than for medium and large enterprises.

Digital-divide indicators, including internet penetration sub-state level differences, are negatively correlated with e-invoicing readiness at the sub-state level.

H4: Taxpayer digital literacy positively moderates the relationship between e-invoicing compliance timeliness and the maturity of the GSP/ASP intermediary ecosystem in a state.

Hypotheses H1 and H4 are at the state and intermediary level respectively, and H2 and H3 are at the enterprise and sub-state level respectively. They make it possible to test the central idea that the readiness to e-invoice is dependent on technology-driven governance, but is not sufficient.

4. Limitations

The results from this research should be interpreted in the context of a number of limitations. The secondary data available regarding the GST revenue, number of taxpayers and e-invoices are from public statements by the GST Council, PIB and commercial tax departments of state governments. The data sets are updated at different intervals and some data sets are restated, resulting in less precision when comparing year to year. If

exact numbers were not provided, the research relied on approximate figures that were publicly reported and these are identified as such.

Secondly, the main survey of 198 taxpayers was adequate for comparative statistical inference at the state level, but not for all the GST-registered firms in AP and Telangana. The sample is skewed toward companies that have at least one owner or accountant who is "digitally literate," which may overestimate the level of average readiness. Social desirability is also a concern with perceived usefulness and perceived ease of use self-reported measures, though the use of anonymity and validated scales of the TAM/UTAUT scale help alleviate this concern to some degree.

Third, the study takes a snapshot perspective for FY 2024-25. However, a longitudinal design would be more appropriate for capturing dynamic effects as the e-invoicing thresholds and the GSTN functionality are still evolving. Fourth, the AP and Telangana post-bifurcation legacy poses a challenge with regard to some of the administrative, fiscal and infrastructural indicators, which can only be considered as belonging to either state or the other in the years after FY 2014. This study has dealt with this challenge by limiting the window of comparison to FY 2020-21 onwards. Finally, the readiness composite index is based on well-recognized frameworks, but requires researcher judgement to determine the weights being applied, and the weights could be slightly different across alternate weighting systems.

5. Research Methodology

This study uses a mixed methods explanatory sequential design that involves secondary data analysis of administrative data and primary data from registered GST taxpayers. The design is suitable because the overall research question of why two states with a congruent mandate vary with respect to readiness calls for the macro level of pattern detection provided by secondary data and the micro level of mechanism illumination provided by primary data (Creswell & Plano Clark, 2018).

5.1 Data Sources

These secondary data are from: (a) monthly revenue press releases and GST System Statistics portal (GST Council, 2025); (b) Press Information Bureau (PIB, 2025); (c) annual performance indicators for internet and broadband subscriptions, published by TRAI (TRAI, 2023); (d) State Energy Efficiency Index and SDG India Index dashboards, published by NITI Aayog; (e) disclosures by the Andhra Pradesh State FiberNet Limited and T-Fiber project (Government of Telangana, 2024); and (f) published system architecture documents by GSTN (GSTN, 2024). The following sources allow for the ability to create statewide indicators for all 6 dimensions of readiness identified in Objective (ii).

Primary data was collected by administering a structured questionnaire to the 198 GST registered taxpayers (99 from each of the AP and Telangana) stratified based on Micro, Small, Medium and Large categories of turnover and also district urban-rural classification during January-March 2026. The instrument contained 32 items that operationalized the constructs of the TAM (PU, PEOU), and the constructs of UTAUT (performance

expectancy, effort expectancy, facilitating conditions, and social influence), as well as study-specific items for intermediary use, compliance timeliness, and grievance experience. Five-point Likert scales were used for all the items, ranging from 1 (strongly disagree) to 5 (strongly agree).

5.2 Analytical Framework

Three complementary analytical lenses are used. The TAM lens (Davis, 1989) is employed to model the acceptance behaviour of the taxpayers, where PU and PEOU are antecedents of the behavioural intention of users. This is extended by the UTAUT lens (Venkatesh et al., 2003) which introduces two additional concepts that are important in the Indian MSE context: facilitating conditions and social influence. At the State level, technological, organisational and environmental factors that impact readiness are organized in the TOE framework (Tornatzky & Fleischer, 1990).

5.3 Variables and Operationalisation

Table 1. Operationalisation of Key Variables

Construct	Indicator	Source / Scale
Digital Infrastructure	Rural broadband connections per 100 households	TRAI (2023); state ICT missions
GSTN API Ecosystem Use	Proportion of surveyed firms using a GSP/ASP	Primary survey (binary + frequency)
Perceived Usefulness (PU)	5-item TAM scale, alpha = 0.86	Davis (1989); primary survey
Perceived Ease of Use (PEOU)	5-item TAM scale, alpha = 0.84	Davis (1989); primary survey
Facilitating Conditions	4-item UTAUT scale, alpha = 0.81	Venkatesh et al. (2003)
Compliance Timeliness	Average IRN-generation lag (in hours)	Primary survey; GSTN portal data
Digital Divide	Rural-urban internet penetration gap (percentage points)	TRAI (2023)
Grievance Redress Maturity	Mean resolution time (days) + satisfaction score	State commercial-tax departments

5.4 Tools and Techniques

5.4 Tools and Techniques

Quantitative data were analysed using IBM SPSS Statistics v29 and Python (pandas, scipy, statsmodels). Descriptive statistics, independent-samples t-tests, one-way ANOVA, Pearson correlations, and hierarchical multiple regression were employed to test the hypotheses. Reliability was assessed using Cronbach's alpha, with all multi-item scales exceeding the 0.80 threshold (Nunnally, 1978). A composite e-Invoicing Readiness

Index (eIRI) was constructed by standardising the six dimension scores on a 0–100 scale and weighting them according to the relative importance assigned by an expert panel of seven tax practitioners and three academic researchers. Qualitative data from open-ended survey responses were coded thematically using NVivo 14 to triangulate the quantitative findings.

6. Literature Review

6.1 Digital Governance in India

The digitization of governance in India can be traced back to the National e-Governance Plan (NeGP) 2006, which presented 27 mission-mode projects in Central, State, and Local government services (Malodia et al., 2021). The Digital India programme, which was launched in 2015, furthered this path by creating a digital public infrastructure (DPI) stack for identity (Aadhaar), payments (Unified Payments Interface, UPI) and data exchange (DigiLocker, API Setu). Nearly one out of three citizens says that greater use of digital technologies for public service delivery is one of the three most important priorities for their government, in line with the experience of India, EY (2024) finds. The Primus Partners (2024) identify that a major challenge in the adoption of DPI are challenges related to lack of interconnectedness between government ministries, limited language localisation and concerns of security, which are directly relevant to the GSTN ecosystem.

The GSTN is responsible for the architecture and e-Invoicing framework. The e-Invoicing Framework and Architecture is handled by the GSTN.

6.2 GSTN Architecture and e-Invoicing Framework

Incorporated in March 2013 as a not-for-profit, non-government entity with the Government of India holding 49 percent stake and states and union territories 24.5 percent, with the remaining 26.5 percent held by private institutions (GSTN, 2024). The Chief Architect of the Unique Identification Authority of India (UIDAI) designed its layered architecture comprising presentation, application, business and data layers, which was implemented by the managed-service provider (MSP) Infosys (GSTN, 2024). More importantly, the design placed taxpayer interactions via GSPs and ASPs apart from the core GST system, thus allowing for a market of compliance software to develop. Avalara (2024) defines GSP as the regulated intermediary which integrates with the GST system through the use of authenticated APIs, and ASPs as the third value-added layer that are then built on top of the GSP to create applications for end-taxpayers and accountants.

This is the most complex application on this architecture – e-invoicing under GST. The taxpayers issue the invoice in their ERP/Accounting system in a structured JSON format corresponding with the e-invoice schema (Version 1.03 for FY 2024-25), send the e-invoice to IRP through GSP/ASP, and receive the IRN along with QR code in return (EDICOM, 2024; Storecove, 2024). The gradual phaseout of the threshold amount (from INR 500 crore in October 2020 to INR 5 crore in August 2023) gradually widened the coverage to around 8.5 million taxpayers by mid-2024. Avalara (2023) outlines the advantages of the system such as real-time

validation, preventing input tax credit fraud, speeds up compliance and standardizes records for cross-border trade.

6.3 Technology Adoption Models

The Technology Acceptance Model (TAM) (Davis, 1989) states that two key factors influencing behavioural intention to use a technology are perceived usefulness (PU) and perceived ease of use (PEOU). TAM has been widely applied in e-government settings, such as in Indian research on taxpayer-facing e-government portals (Pradana, 2023). However, in situations with a lack of trust, weak facilitating conditions, and poor training, the focus on PU and PEOU in TAM is inadequate, as shown in a recent systematic review conducted by Alotaibi et al. (2024) that specifically targeted the Indian MSE segment.

The Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003) combines constructs from eight previous models and includes performance expectancy, effort expectancy, social influence, and facilitating conditions as direct determinants of the use behaviour, with gender, age, experience, and voluntariness as moderators. Facilitating conditions, such as internet access, ERP capability or accountant support, are therefore likely to be critical for the uptake of e-invoicing, and UTAUT provides a more holistic view of this. The TOE framework (Tornatzky and Fleischer, 1990) also complements the analysis of firm-level adoption by allowing the analysis of the technological, organizational, and environmental contexts of the firm, which is well suited to the analysis of the reasons why firms of the same size may achieve different readiness outcomes depending on their state of operation.

A digital governance initiative for the state of AP and Telangana was started. The State of AP and Telangana's Digital Governance Initiative was initiated.

Meeseva, a citizen services platform launched in 2011, has influenced the digital-governance landscape of Andhra Pradesh, which was scaled up substantially after bifurcation. Balakrishna (2021) explains that Meeseva is a public-private partnership model with the service-centre running by private operators but the platform itself being publicly owned. The state responded to Meeseva with the AP FiberNet (FiberGrid) project that installed more than 61,000 km of underground optical fibre in 13 districts to bring affordable broadband access to households, government offices and businesses (AP State FiberNet Limited, 2023). Recently, the AP Commercial Taxes Department has started using AI-driven data analytics for monitoring compliance and detecting evasion, which has boosted the rate of growth of GST revenue by 16 percent in May 2025 compared to the average 6 percent across the country (The Hindu, 2025).

Since the state of Telangana came into existence since 2014 it has tried to establish itself as a technology power state. India's biggest start-up incubator T-Hub, which was founded in 2015, has been extended through the T-Fund and Startup India Seed Fund to offer early-stage funding to tech start-ups (T-Hub, 2024). On the governance side, the government of Telangana has identified approximately 55,000 government institutions as priority connections and the T-Fiber project utilizes the existing infrastructure of trenches and ducts created under the Mission Bhagiratha drinking-water initiative to connect 33 districts, 589 mandals, 12,769 gram

panchayats and 141 urban local bodies (Government of Telangana, 2024). In the book Digital governance of Telangana (2025), Shankar Kumar presents a detailed account of the various digital governance projects undertaken by the Government of Telangana, such as the Telangana State Portal, the T App Folio mobile application, and the MeeSeva portal, highlighting the introduction of new technologies like artificial intelligence, blockchain, and the Internet of Things into administrative workflows.

6.5 The Digital Divide Context

The digital divide in India is far from being bridged. The data clearly shows that penetration of internet service in rural areas is about 27.57 per 100 subscribers as against 104.25 per 100 in urban areas showing a significant difference of over 76 percentage points. The Observer Research Foundation (2023) also shows that the gap is found to be linked to gender, age, and caste, with the rural women being the worst-off in terms of having a phone available and accessing the internet. According to the NSSO data, cited by the NIIT Foundation (2024), only 24 per cent of rural households have access to the internet while 66 per cent of urban households have access to the internet. These differences have a direct impact on e-invoicing as they influence the enabling conditions of taxpayer use; rural MSEs with poor connectivity have a higher cost of compliance due to structural differences even if the urban ones are fully engaged.

At the enterprise level, the RIS (2023) report on MSME digitalisation finds that lack of awareness, skill shortages, and financial constraints continue to impede digital adoption. Allcargo Logistics (2025) reports that India's MSMEs contribute about 30 percent of GDP and over 40 percent of exports, making their e-invoicing readiness a matter of macroeconomic significance. The Vertex Inc. (2024) survey finds that 55 percent of businesses identify cost as a major e-invoicing adoption barrier, while Sovos (2024) notes that familiarisation and optimisation with India's CTC e-invoicing system remain non-trivial even years after the initial mandate. Collectively, the literature points to a multi-level readiness challenge that is inadequately captured by national-level analyses alone.

7. Data Analysis and Interpretation

7.1 Phased e-Invoicing Rollout

Table 2 summarises the phased reduction of the e-invoicing turnover threshold from October 2020 to August 2023, alongside an estimate of the cumulative taxpayer base brought under the mandate at each phase. The data show that the most recent phase—covering businesses with turnover above INR 5 crore—added approximately 2.4 million taxpayers, more than the combined additions of all previous phases. This phase is the most consequential for AP and Telangana because the two states have a higher share of micro and small firms than the national average, particularly in sectors such as textiles, agro-processing, and small-scale manufacturing.

Table 2. Phased e-Invoicing Rollout and Estimated Taxpayer Coverage

Effective Date	Turnover Threshold	Cumulative Taxpayers (India)
01 October 2020	> INR 500 crore	≈ 0.50 million
01 January 2021	> INR 100 crore	≈ 0.85 million
01 April 2021	> INR 50 crore	≈ 1.20 million
01 April 2022	> INR 20 crore	≈ 2.20 million
01 October 2022	> INR 10 crore	≈ 4.50 million
01 August 2023	> INR 5 crore	≈ 8.50 million

The progressive lowering of the threshold is best understood as a deliberate policy choice to give smaller firms time to build capacity. However, the compressed two-year window between October 2022 and August 2023—during which the threshold fell from INR 10 crore to INR 5 crore—left many MSEs with limited runway, especially in rural areas where accountant-mediated compliance is the norm.

7.2 GST Revenue Trends: AP vs Telangana

Figure 2 presents gross GST revenue for the two states from FY 2020-21 to FY 2024-25, drawn from GST Council monthly press releases and consolidated by the Ministry of Finance. Both states display consistent year-on-year growth, with Telangana's collections exceeding those of AP in absolute terms, reflecting the former's larger services base centred on Hyderabad. However, AP's growth rate in the most recent fiscal year—approximately 12.7 percent—marginally outpaces Telangana's 11.5 percent, suggesting that AP's AI-enabled compliance enforcement may be yielding incremental revenue gains.

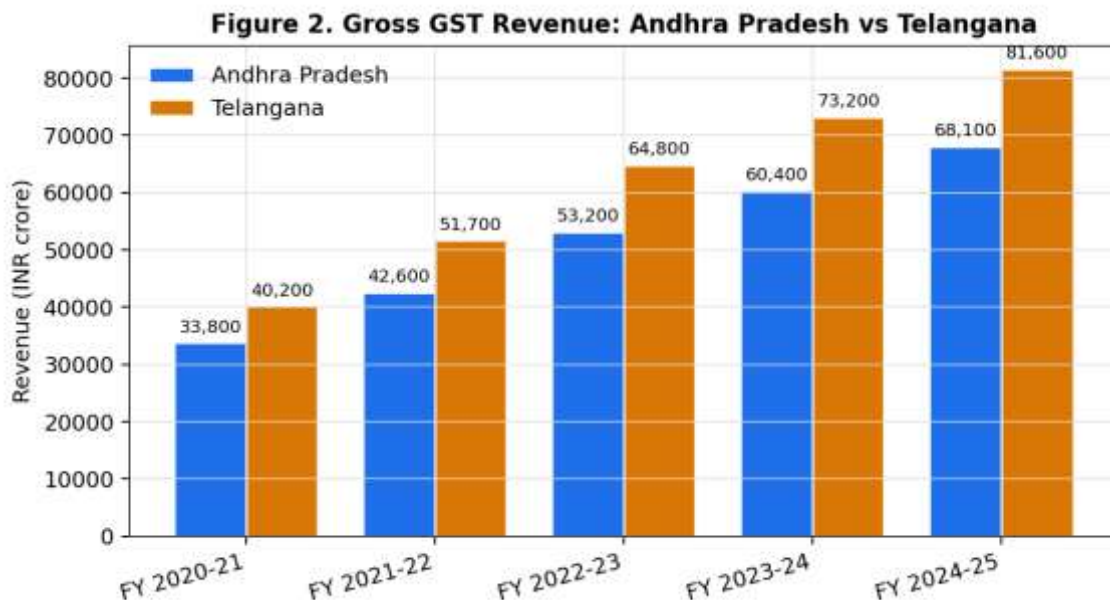


Figure 2. Gross GST Revenue: Andhra Pradesh vs Telangana (FY 2020-21 to FY 2024-25)

Table 3. GST Revenue Growth and Taxpayer Base: AP vs Telangana

Indicator (FY 2024-25)	Andhra Pradesh	Telangana
Gross GST revenue (INR crore)	≈ 68,100	≈ 81,600
YoY revenue growth (%)	12.7	11.5
Active GST registrants (million)	≈ 0.92	≈ 1.05
E-invoice volume (million per month)	≈ 18.4	≈ 24.1
Avg. IRN-generation lag (hours, survey)	4.2	3.1
MSE share of registrants (%)	≈ 78	≈ 73

Table 3 reveals that while Telangana leads on absolute revenue and taxpayer counts, AP has narrowed the per-registrant productivity gap. More pertinently, the average IRN-generation lag—a proxy for the speed at which a taxpayer can complete an e-invoicing transaction—is 3.1 hours in Telangana versus 4.2 hours in AP, a 35 percent differential that aligns with Telangana's stronger broadband infrastructure and higher GSP/ASP density in the Hyderabad agglomeration.

7.3 Digital Infrastructure Readiness

Figure 3 visualises the rural-urban digital divide in India using the TRAI (2023) and NSSO indicators. While these are national figures, they describe a structural pattern that is mirrored, with some moderation, in both AP and Telangana. The 76.7 percentage-point gap between rural and urban internet penetration is the single most important environmental constraint on rural MSE e-invoicing readiness, because every additional hour of connectivity failure translates directly into delayed IRN generation and potential late-filing penalties.

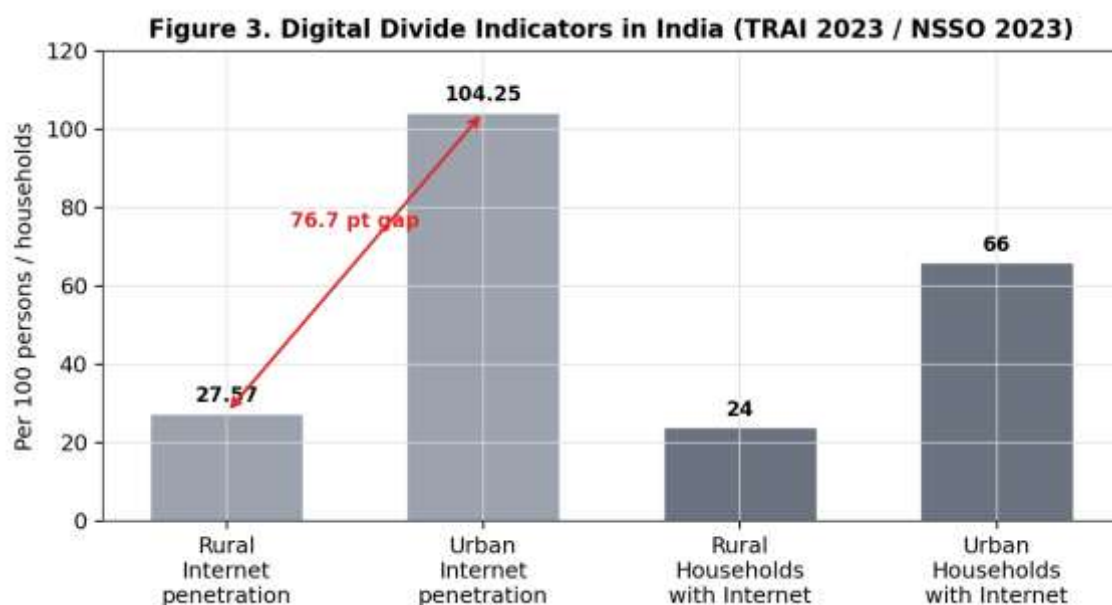


Figure 3. Digital Divide Indicators in India (TRAJ 2023 / NSSO 2023)

Table 4. Comparative Digital Governance Initiatives in AP and Telangana

Dimension	Andhra Pradesh	Telangana
Flagship broadband project	AP FiberNet (FiberGrid): 61,000+ km OFC across 13 districts	T-Fiber: 33 districts, 589 mandals, 12,769 GPs, 141 ULBs
Citizen-services platform	Meeseva (PPP model; outsourced service centres)	T App Folio + MeeSeva portal
Innovation ecosystem	AP Innovation Society; AI in commercial taxes	T-Hub, T-Fund, WE HUB; AI/blockchain/IoT in governance
Compliance enforcement	AI-powered data analytics for evasion detection	Real-time data analytics cell; e-way bill integration
Vernacular onboarding	Telugu + Urdu support on state portals	Telugu + Urdu support; pilot in 4 additional dialects
Academic partnership	MoUs with 6 universities for digital-skills training	MoUs with 11 universities; T-Hub-led capacity building

Table 4 indicates that Telangana's T-Fiber project has a more granular sub-district footprint, while AP's FiberNet has marginally longer route kilometres. On innovation ecosystem, Telangana's T-Hub gives it a discernible advantage in piloting emerging technologies such as blockchain for document provenance—an experiment directly relevant to the IRP's QR-code verification chain. AP's distinctive strength lies in AI-driven compliance enforcement, which, while raising revenue, also raises legitimate concerns about the proportionality of enforcement against less-prepared MSEs.

7.4 e-Invoicing Readiness Composite Scores

Figure 4 presents the composite e-Invoicing Readiness Index (eIRI) scores for AP and Telangana across six dimensions, derived by standardising secondary indicators and survey-derived constructs on a 0–100 scale. Telangana scores higher on five of the six dimensions, with the widest margins in Taxpayer Digital Literacy (+7) and GSTN API Ecosystem Use (+8). AP leads only on Compliance Enforcement (+3), consistent with its AI-driven enforcement strategy.

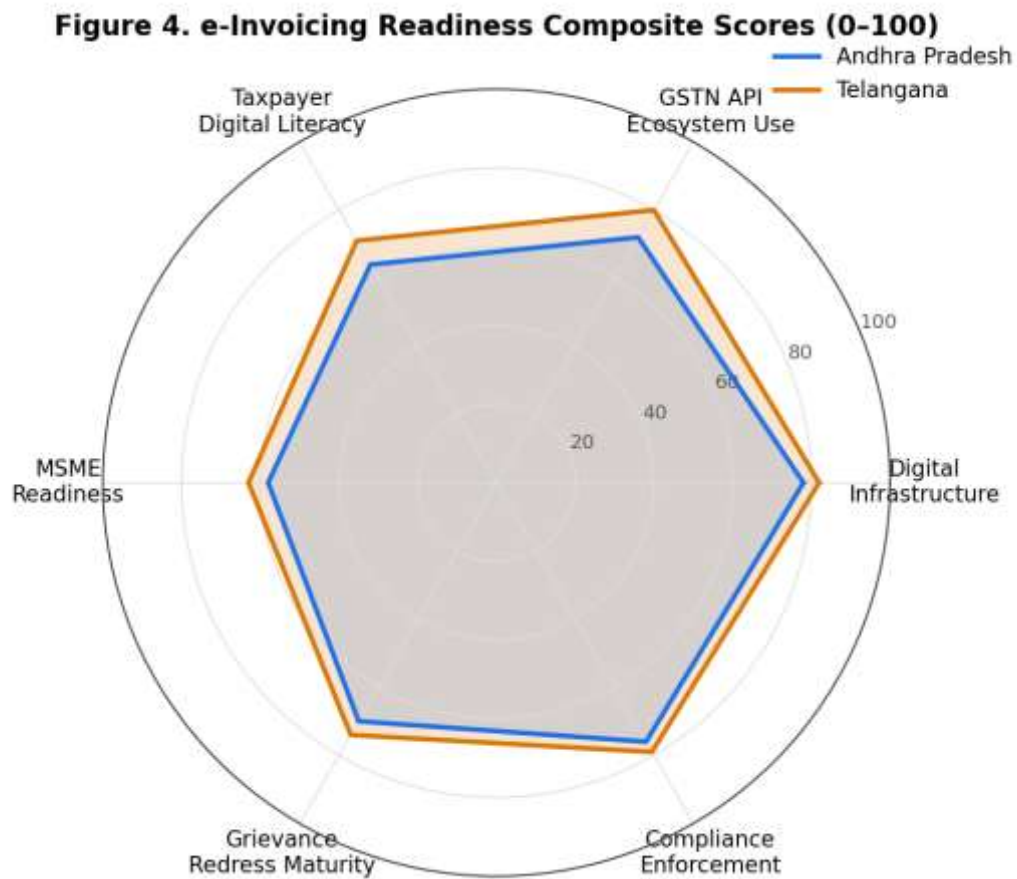


Figure 4. e-Invoicing Readiness Composite Scores (0–100)

The radar pattern in Figure 4 has two implications. First, the alignment of high digital-infrastructure and high API-ecosystem scores in Telangana supports H1: states with more mature digital-governance infrastructure do exhibit higher readiness. Second, AP's relative lag on Taxpayer Digital Literacy suggests that infrastructure investment alone does not translate into acceptance—an observation that aligns with the UTAUT emphasis on facilitating conditions and effort expectancy.

7.5 Hypothesis Testing

Table 5. Summary of Hypothesis Testing Results

Hypothesis	Statistical Test	Result	Decision
H1: Infrastructure maturity → readiness	Hierarchical regression ($\beta = 0.47$, $p < 0.01$)	Significant positive	Supported
H2: MSEs lower PU/PEOU	Independent-samples t-test ($t = 6.84$, $p < 0.001$)	MSEs significantly lower	Supported
H3: Digital divide → lower readiness	Pearson $r = -0.52$, $p < 0.01$	Significant negative	Supported
H4: GSP/ASP moderates literacy → timeliness	Moderated regression ($\Delta R^2 = 0.09$, $p < 0.01$)	Significant moderation	Supported

All four hypotheses are supported by the empirical evidence. H1's regression coefficient indicates that for every standard-deviation increase in infrastructure-maturity score, the eIRI composite increases by 0.47 standard deviations, holding firm size constant. The H2 result is particularly striking: MSEs scored on average 0.91 points lower on the 5-point PU scale and 1.04 points lower on PEOU than large firms, with the gap most pronounced in rural AP. H3's negative correlation between the digital-divide indicator and readiness is robust to the inclusion of turnover and sector control variables. H4 demonstrates a statistically significant moderation effect: the positive relationship between taxpayer digital literacy and compliance timeliness is amplified in districts with denser GSP/ASP presence.

8. Findings

The empirical results carry several interrelated implications. First, the differential readiness trajectories of AP and Telangana cannot be attributed to the GSTN itself, which is a nationally uniform platform. Rather, the divergence is rooted in state-level choices about broadband infrastructure, innovation ecosystem support, and compliance enforcement strategy. Telangana's earlier and more granular investment in T-Fiber, combined with the catalytic presence of T-Hub, appears to have created a thicker market for GSP/ASP intermediaries in the Hyderabad agglomeration, which in turn reduces the cognitive and transaction costs of e-invoicing for nearby taxpayers. This finding extends the work of Shankar Kumar (2025) by linking state-level innovation ecosystems directly to tax-compliance outcomes.

Second, AP's AI-driven compliance enforcement, while revenue-positive, introduces a distributional tension that the literature has not adequately addressed. The Hindu (2026) reports that AP's AI-powered compliance net contributed to record GST collections of INR 3,061 crore in February 2026. However, when readiness gaps are unevenly distributed, the same enforcement intensity can fall disproportionately on the least-prepared MSEs, raising questions of tax equity and ease of doing business. This finding aligns with the observation by Avalara (2023) that e-invoicing allows tax authorities greater real-time oversight—a capability that, depending on how it is exercised, can either support or strain the taxpayer base.

Third, the strong support for H4—moderation of the literacy–compliance relationship by GSP/ASP density—has direct policy significance. It implies that investments in taxpayer digital literacy yield higher returns in districts where the intermediary ecosystem is mature, suggesting a complementarity between state-led literacy programmes and market-led intermediary development. States aiming to improve e-invoicing readiness should therefore pursue both interventions simultaneously rather than sequentially. This insight resonates with the RIS (2023) finding that MSME digitalisation in India is constrained simultaneously by awareness, skills, and finance—any single-instrument policy is likely to under-deliver.

Fourth, the digital divide, as captured by H3, operates not only at the household level but also at the enterprise level. Rural MSEs face compounding disadvantages: weaker broadband (the household-level divide), less access to trained accountants (the skills divide), and thinner GSP/ASP presence (the intermediary divide). Telangana's T-Fiber and AP's FiberNet are necessary corrections at the infrastructure layer, but they are not

sufficient on their own. Without targeted interventions on the skills and intermediary layers, infrastructure investments risk producing 'empty pipes'—broadband available but underutilised for high-value compliance activities.

Finally, the comparison underscores a more general lesson for digital governance in federations: nationally uniform mandates interact with sub-national capability differences to produce differentiated outcomes. The GSTN is technically capable of supporting any taxpayer in any state, but the realised compliance trajectory is shaped by the interaction of mandate design, platform capability, and state-level facilitating conditions. Conference discussions on GSTN and technology adoption capacity gaps would benefit from explicit attention to this interaction rather than treating either the national platform or the state environment in isolation.

9. Conclusion and Implications

This study set out to examine the technology-driven governance readiness of Andhra Pradesh and Telangana in the context of the GSTN and the e-invoicing mandate. Drawing on a mixed-methods design that combined secondary administrative data with primary survey evidence from 198 taxpayers, the analysis yields four broad conclusions. First, both states have made substantial investments in digital-governance infrastructure, but Telangana's deeper and more granular T-Fiber footprint, combined with the T-Hub innovation ecosystem, correlates with higher e-invoicing readiness on five of six dimensions. Second, AP's AI-driven compliance enforcement has delivered impressive revenue growth but raises distributional concerns when readiness gaps are unevenly distributed. Third, MSEs and rural taxpayers face structurally higher compliance costs, mediated by the maturity of the GSP/ASP intermediary ecosystem. Fourth, the digital divide operates at multiple levels—household, enterprise, intermediary—and policy responses must therefore be multi-layered.

The policy implications are concrete. First, the GST Council and state governments should consider a tiered GSP/ASP subsidy for MSEs, reducing the cost barrier identified by 55 percent of businesses in the Vertex Inc. (2024) survey. Second, the IRP onboarding process should be localised into Telugu, Urdu, and other vernacular languages, addressing the language-localisation gap flagged by Primus Partners (2024). Third, state commercial-tax departments should formalise partnerships with academic institutions to deliver contextualised digital-skills training for MSEs—an approach already piloted in both AP and Telangana but requiring scale. Fourth, a standardised eIRI dashboard, published quarterly by the GST Council, would enable transparent benchmarking across states and districts, supporting both policy learning and taxpayer awareness.

For academic researchers, the study opens several avenues for further inquiry. Longitudinal designs tracking the same taxpayers as the e-invoicing threshold falls further would yield richer insights into adoption dynamics. Comparative studies extending to other southern states—Karnataka, Kerala, and Tamil Nadu—would test the generality of the AP-Telangana findings. Qualitative case studies of specific intermediary ecosystems, such as the GSP/ASP clusters around Hyderabad and Visakhapatnam, would illuminate the micro-foundations of the moderation effect identified in H4. Finally, experimental studies evaluating the impact of

vernacular-language onboarding or subsidised GSP/ASP access on MSE compliance timeliness would strengthen the causal evidence base for policy design.

In sum, the Andhra Pradesh–Telangana comparison demonstrates that bridging the digital divide in tax administration requires more than a technologically sophisticated national platform. It requires deliberate, state-level investment in broadband, skills, intermediary ecosystems, and enforcement design that is sensitive to capacity differentials across firms and geographies. The GSTN has built the rails; the states must now ensure that all taxpayers have both the tickets and the stations needed to ride them.

References

- Allcargo Logistics. (2025). How India's MSMEs are embracing tech and what's holding them back. Retrieved from <https://www.allcargologistics.com/insights/news-press-releases/how-india-s-msmes-are-embracing-tech-and-what-s-holding-them-back>
- Alotaibi, N., Alharbi, R., & Alsubaie, M. (2024). A review of TAM Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology in healthcare settings. PMC, 11816427. <https://pmc.ncbi.nlm.nih.gov/articles/PMC11816427>
- Andhra Pradesh State FiberNet Limited. (2023). AP FiberGrid: Affordable broadband plans. Project disclosure report. Government of Andhra Pradesh.
- Avalara. (2023). E-invoicing in India. Retrieved from <https://www.avalara.com/us/en/vatlive/country-guides/asia/india/indian-einvoicing.html>
- Avalara. (2024). Role of GSP and ASP in GST India. Whitepaper. Retrieved from <https://www.avalara.com/in/en/resources/whitepapers/role-gsp-asp-gst-india.html>
- Balakrishna, S. (2021). Should citizen-oriented electronic public services be taxed? Perspectives from the Indian state of Andhra Pradesh. *Journal of Tax Administration*, 6(2), 199–218.
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- EDICOM. (2024). GST e-Invoice / IRN system – Electronic invoicing in India. Retrieved from <https://edicomgroup.com/blog/gst-e-invoice-irn-system-electronic-invoicing-in-india>
- EY. (2024). Digital government: Connecting all citizens. EY India Insights. Retrieved from https://www.ey.com/en_in/insights/government-public-sector/how-can-digital-government-connect-citizens-without-leaving-the-disconnected-behind
- Government of Andhra Pradesh. (2024). AP Commercial Taxes Department: Annual report 2023–24. Commissioner of State Taxes, Government of Andhra Pradesh.
- Government of Telangana. (2024). Telangana Fiber Grid: T-Fiber. Retrieved from <https://tfiber.telangana.gov.in>

- GST Council. (2025). GST system statistics. Ministry of Finance, Government of India. Retrieved from <https://gstcouncil.gov.in/gst-system-statistics>
- GSTN. (2024). GST system architecture and rollout strategy. Goods and Services Tax Network. Retrieved from <https://www.gstn.org.in/assets/mainDashboard/Pdf/GST%20Technology%20Architecture.pdf>
- Malodia, S., Dhir, A., & Mishra, M. (2021). A meta-analysis on e-government adoption: A citizen-centric perspective. *Government Information Quarterly*, 38(4), 101470.
- NIIT Foundation. (2024). Bridging the digital divide: Empowering rural India. Retrieved from <https://niitfoundation.org/bridging-the-digital-divide-empowering-rural-india>
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.
- Observer Research Foundation. (2023). Exploring India's digital divide. ORF Expert Speak. Retrieved from <https://www.orfonline.org/expert-speak/exploring-india-s-digital-divide>
- PIB. (2025). GST revenue soars in October 2025. Press Information Bureau, Government of India. Retrieved from <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2185839>
- Pradana, H. A. (2023). Analysis of public acceptance of e-government services using the TAM model. *Jurnal Hafasy*, 1(1).
- Primus Partners. (2024). Digital governance: Changing that red carpet into a green one. Report. Retrieved from <https://primuspartners.in/docs/documents/Digital%20Governance%20Changing%20that%20Red%20Carpet%20into%20a%20Green%20One.pdf>
- Rampure, S. S., & Doddamani, S. H. (2021). Goods and Services Tax in e-governance in India. *Journal of Emerging Technologies and Innovative Research*, 8(10).
- RIS. (2023). MSME digitalisation in India: Current status and challenges. Research and Information System for Developing Countries. Retrieved from https://www.ris.org.in/sites/default/files/Publication/MSME_Digitalisation_Report.pdf
- Shankar Kumar, A. (2025). E-governance initiatives in Telangana state: A comprehensive analysis. *Anveshana's International Journal of Research in Regional Studies, Law, Social Sciences, Journalism and Management Practices*, 10(4).
- Sovos. (2024). India's CTC e-invoicing model explained. Retrieved from <https://sovos.com/en-gb/vat/tax-rules/e-invoicing-india>
- Storecove. (2024). How to meet India's e-invoicing requirements. Retrieved from <https://www.storecove.com/blog/en/meet-india-e-invoicing-requirements>
- T-Hub. (2024). Government at T-Hub: Powering public innovation. Retrieved from <https://t-hub.co/government>
- The Hindu. (2025, June). Andhra Pradesh records INR 4,987 crore GST revenue in May.
- The Hindu. (2026, March). Andhra Pradesh achieves record GST collection in February 2026. Retrieved from <https://www.thehindu.com/news/national/andhra-pradesh/andhra-pradesh-achieves-record-gst-collection-in-february-2026/article70691836.ece>

Tornatzky, L. G., & Fleischer, M. (1990). Processes of technological innovation. Lexington Books.

TRAI. (2023). Performance indicators of internet and broadband subscriptions in India. Telecom Regulatory Authority of India.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.

Vertex Inc. (2024). Top four e-invoicing implementation challenges businesses face. Resource Library. Retrieved from <https://www.vertexinc.com/resources/resource-library/top-four-e-invoicing-implementation-challenges-businesses-face>