GST Analytics and MSME Compliance Behaviour: An Empirical Study of Businesses in Telangana

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The digitalisation of Goods and Services Tax (GST) has changed the way Micro, Small and Medium Enterprises (MSMEs) maintain records, reconcile transactions, claim input tax credit and complete statutory filings. For smaller businesses, however, the availability of digital systems does not by itself guarantee disciplined compliance. This study examines whether the ability to use GST-related data and analytics is associated with stronger compliance behaviour among MSMEs in Telangana. The research framework draws on the practical issues documented in earlier Nizamabad-based MSME research, particularly compliance burden, input-tax-credit reconciliation, digital literacy, dependence on accountants and GST practitioners, and the need for regular record maintenance. GST analytics capability, GST knowledge, digital literacy, perceived ease of compliance, compliance cost, trust in digital tax administration and perceived enforcement were treated as explanatory variables, with MSME compliance behaviour as the dependent variable. A structured questionnaire was administered to 300 GST-registered MSMEs drawn from eleven districts of Telangana, covering manufacturing, trading and service enterprises across urban, semi-urban and rural locations. The field data show that GST analytics capability ($\beta = 0.28$, $p < 0.001$) and GST knowledge ($\beta = 0.26$, $p < 0.001$) are the strongest positive predictors of compliance behaviour, followed by trust ($\beta = 0.12$, $p = 0.010$) and ease of compliance ($\beta = 0.11$, $p = 0.034$); compliance cost is a significant negative predictor ($\beta = -0.11$, $p = 0.007$). Together the seven predictors explain close to 27 per cent of the variance in compliance behaviour ($R^2 = 0.269$, $F = 15.33$, $p < 0.001$). Digital literacy and perceived enforcement do not exert an independent, statistically significant effect once the other constructs are controlled for, although digital literacy works indirectly: it strengthens GST analytics capability, which in turn drives compliance behaviour, a full-mediation pathway confirmed through the Sobel test ($z = 3.78$, $p < 0.001$). Compliance behaviour does not differ significantly across enterprise size, sector or location, suggesting that the practical experience of GST compliance in Telangana is broadly similar irrespective of these characteristics. The paper argues that GST analytics should be understood not merely

as a monitoring mechanism for tax authorities but as a business capability that helps MSMEs identify mismatches, reduce filing errors, monitor input tax credit and improve the timeliness of compliance. Technology-supported compliance is likely to be more effective when accompanied by practical training, simplified procedures, affordable accounting tools and local-language support.

Keywords: GST analytics, MSMEs, compliance behaviour, digital literacy, GST knowledge, input tax credit, Telangana, tax compliance, digital taxation.

1. Introduction

Goods and Services Tax (GST), introduced in India with effect from 1 July 2017, represented a major restructuring of the indirect-tax system. The reform brought several central and state-level indirect taxes into a common framework and sought to reduce cascading, support a national market and improve transparency in tax administration. For MSMEs, the reform was especially consequential because compliance increasingly depends on digital records, electronic invoices, return filing, input-tax-credit reconciliation and interaction with the GST portal.

The experience of smaller enterprises has not been uniform. Earlier Nizamabad-based research on the sector documented clear benefits of GST, including a reduction in the cascading effect through input tax credit, a more standardised tax structure, easier inter-state trade and a push towards formal record keeping. At the same time, respondents in that study reported frequent return filing, additional expenditure on accountants and compliance software, delays affecting working capital, and difficulty understanding tax provisions. Low digital literacy and inadequate GST awareness were identified as particularly important challenges among micro enterprises in rural and semi-urban areas of Nizamabad.

These observations suggest that GST compliance should be examined as a behavioural outcome of both tax knowledge and digital capability. A business may possess a GST registration and an accounting package but still experience compliance difficulties if sales and purchase records are not maintained regularly, input tax credit is not reconciled, or the owner is unable to interpret the information generated by the system.

The present study builds on this practical background but moves the research question one step further. Instead of asking only whether GST has created benefits or difficulties, it asks whether the analytical use of GST information helps explain differences in compliance

behaviour among MSMEs. GST analytics in this study refers to the use of accounting reports, GST portal information, reconciliation statements, exception reports, dashboards and related digital tools to monitor tax transactions and identify potential compliance problems before filing.

The topic is particularly relevant to Telangana, where the MSME base spans agro-processing, trading and service activities, with many family-owned micro enterprises and limited formal accounting infrastructure in several districts. Such enterprises provide a useful context for examining how digital capability interacts with compliance requirements. The present article draws on a field survey of 300 GST-registered MSMEs across eleven districts of Telangana to build an empirically grounded picture of how GST analytics capability relates to compliance behaviour.

2. Need and Significance of the Study

The GST environment has matured considerably since its introduction. Early research concentrated on transition difficulties, tax rates, return filing and the immediate effects of digitalisation. Field evidence from the Nizamabad MSME sector shows that compliance costs, working-capital pressure, changing procedures and uneven digital literacy continue to affect smaller businesses. A current study is therefore needed to examine the capabilities that help businesses cope with a mature digital compliance system rather than focusing only on the initial GST transition.

The study is significant for MSME owners because better use of GST data can reduce avoidable errors and improve the timing of compliance activities. It is relevant to accountants and GST practitioners because it shifts attention from return preparation towards preventive reconciliation and advisory support. It is also relevant to policymakers because the findings indicate whether training, simplification and digital facilitation should be targeted differently across micro, small and medium enterprises.

3. Review of Literature

3.1 GST and MSME Compliance

The literature on GST and MSMEs presents the reform as one with both efficiency gains and compliance costs. Pareek and Sharma (2019) reported benefits such as simplified tax procedures and more efficient inter-state movement, while Dhillon, Kaur and Singh (2022) identified compliance costs, procedural changes and input-tax-credit delays as important

challenges. Dhavaleshwar (2024) similarly reported that smaller firms with limited accounting infrastructure faced difficulty with return filing and reconciliation. These studies indicate that firm capability is an important condition for effective GST compliance.

Garg and Bansal (2020) found that firms with organised accounting systems and prior exposure to formal taxation adapted more readily to GST. Ghosh (2021) linked invoice matching and digital filing with the gradual development of a stronger compliance culture. Srivastava and Tiwari (2021) highlighted formalisation benefits, including improved access to formal credit, while also recognising the additional compliance workload. The overall evidence suggests that GST can improve formalisation and transparency, but the adjustment burden is not evenly distributed across enterprises.

3.2 Digital Literacy and Technology-Enabled Compliance

Field evidence from Nizamabad provides a strong local basis for treating digital literacy as a determinant of compliance. Low digital literacy has been identified as a key challenge in ensuring timely and accurate compliance, particularly among micro enterprises. GST has encouraged digitalisation and formal record keeping, but the benefits are constrained when owners have limited awareness or technical capability.

This study interprets digital literacy more broadly than simple portal navigation. It includes the ability to use accounting software, generate and review digital invoices, reconcile records, understand exception reports and obtain useful information from GST-related data. Such capability makes compliance more proactive rather than deadline-driven.

3.3 Compliance Cost, Working Capital and Behaviour

The literature repeatedly identifies compliance cost as a burden for smaller enterprises. Field observations record additional expenditure on accountants, GST practitioners and compliance software, while delayed input-tax-credit processing can constrain working capital. These pressures matter behaviourally because a firm that perceives compliance as expensive and time-consuming may rely heavily on external intermediaries or postpone internal monitoring until the filing deadline.

3.4 GST Analytics as an Emerging Research Dimension

Most GST-MSME studies focus on awareness, impact, compliance burden, profitability, working capital, formalisation and digitalisation. The distinct capability of using GST data analytically receives less direct attention. This creates an opportunity to examine whether

businesses that regularly reconcile records, use exception reports, monitor tax liabilities and review input tax credit show stronger compliance behaviour. The present study treats GST analytics capability as the central explanatory construct rather than as a background feature of the GST system.

4. Research Gap

The existing literature provides substantial evidence on the positive and negative effects of GST on MSMEs, but three gaps are apparent. First, many studies describe digitalisation without measuring the analytical use of GST data as a separate business capability. Second, a large part of the regional evidence is concentrated in individual states or districts, with comparatively limited empirical work linking GST analytics to compliance behaviour across Telangana. Third, existing work often examines compliance burden and awareness separately; fewer studies integrate GST knowledge, digital literacy, analytics capability, compliance cost and institutional perceptions within a single behavioural model tested on field data. This study addresses these gaps through a Telangana-focused empirical framework built on a 300-respondent survey.

5. Objectives of the Study

- To assess the level of GST knowledge and digital literacy among selected MSMEs in Telangana.
- To examine the extent to which MSMEs use GST-related analytics, reconciliation and digital monitoring tools.
- To analyse the relationship between GST analytics capability and MSME compliance behaviour.
- To determine the influence of GST knowledge, digital literacy, ease of compliance, compliance cost, trust and perceived enforcement on compliance behaviour.
- To examine whether compliance behaviour differs across micro, small and medium enterprises and across manufacturing, trading and service businesses.
- To suggest practical measures for strengthening analytics-enabled GST compliance among MSMEs in Telangana.

6. Hypotheses of the Study

- H1: GST knowledge has a significant positive influence on MSME compliance behaviour.
- H2: Digital literacy has a significant positive influence on MSME compliance behaviour.
- H3: GST analytics capability has a significant positive influence on MSME compliance behaviour.
- H4: Perceived ease of GST compliance has a significant positive influence on MSME compliance behaviour.
- H5: Compliance cost has a significant negative influence on MSME compliance behaviour.
- H6: Trust in digital GST administration has a significant positive influence on MSME compliance behaviour.
- H7: Perceived enforcement has a significant positive influence on MSME compliance behaviour.
- H8: GST analytics capability mediates the relationship between digital literacy and MSME compliance behaviour.

7. Conceptual Framework

The framework combines the practical compliance issues identified in earlier Nizamabad-based field research with a behavioural logic linking capability, perception and outcome. GST knowledge and digital literacy represent the firm's capability base. GST analytics capability represents the application of that capability to transaction monitoring and reconciliation. Perceived ease of compliance and trust reflect how the business evaluates the digital tax environment. Compliance cost represents the burden side of the model, while perceived enforcement represents external pressure. Compliance behaviour is the outcome variable.

Construct	Role	Indicative dimensions
GST Knowledge	Capability	Registration, return filing, ITC, invoice and tax-rate awareness
Digital Literacy	Capability	Portal use, accounting software, e-invoice/e-way bill handling
GST Analytics Capability	Core predictor	Reconciliation, dashboards, exception alerts, liability monitoring
Ease of Compliance	Perception	Ease of filing, error correction and system navigation

Construct	Role	Indicative dimensions
Compliance Cost	Constraint	Time, software expense, professional fees and staff effort
Trust	Institutional perception	Reliability, transparency and confidence in digital administration
Perceived Enforcement	External pressure	Notices, scrutiny, penalty awareness and audit visibility
Compliance Behaviour	Dependent variable	Timely filing, accurate reporting, ITC reconciliation and payment discipline

Table 1: Constructs used in the conceptual framework

8. Research Methodology

8.1 Research Design

The study follows a descriptive-cum-analytical quantitative design. The unit of analysis is the MSME business, represented by its owner, proprietor, partner, manager or accountant directly responsible for GST compliance. The study is cross-sectional and uses a structured questionnaire supported by secondary information from government and published sources.

8.2 Population and Sampling

The population comprises GST-registered MSMEs operating in Telangana across manufacturing, trading and service sectors. A purposive-cum-stratified sampling approach was used, with sectoral representation and coverage of urban, semi-urban and rural business locations. A total of 300 valid, fully completed responses were collected from GST-registered MSMEs spread across eleven districts of Telangana, namely Hyderabad, Nizamabad, Warangal, Medak, Karimnagar, Kamareddy, Mahabubnagar, Sangareddy, Adilabad, Nalgonda and other locations grouped together, giving the sample a reasonably wide geographic base rather than a single-district concentration.

8.3 Questionnaire Design

The questionnaire was structured into five sections. Section A captured respondent and enterprise profile, including gender, age, education, role, enterprise type, category, ownership, location, years in business and years of GST experience. Section B measured GST knowledge and digital literacy. Section C measured GST analytics capability and ease of compliance. Section D measured compliance cost, trust and perceived enforcement. Section E measured compliance behaviour. All construct items used a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The instrument was pilot-tested before final administration.

8.4 Measurement

Variable	Items	Sample indicator	Scale
GST Knowledge	5	I understand the GST return and ITC requirements applicable to my business.	5-point Likert
Digital Literacy	5	I can independently use GST-related digital applications and accounting software.	5-point Likert
GST Analytics Capability	6	My business regularly uses reconciliation or analytical reports to identify GST mismatches.	5-point Likert
Ease of Compliance	4	Digital GST procedures make it easier for my business to complete compliance activities.	5-point Likert
Compliance Cost	5	GST compliance requires substantial time, staff effort and professional expenditure.	5-point Likert
Trust	4	I consider the digital GST system reliable and transparent.	5-point Likert
Perceived Enforcement	4	The possibility of scrutiny or notices encourages timely GST compliance.	5-point Likert
Compliance Behaviour	6	My business files returns on time and regularly reconciles GST records.	5-point Likert

Table 2: Measurement of study constructs

8.5 Statistical Tools

Frequency and percentage analysis was used for profile variables; mean and standard deviation for construct-level assessment; Cronbach's alpha for internal consistency; Pearson correlation for bivariate relationships; multiple regression for direct effects on compliance behaviour; one-way ANOVA for group comparisons across enterprise category, enterprise type and location; and the Baron-and-Kenny procedure together with the Sobel test for the mediating role of GST analytics capability. Confirmatory factor analysis and PLS-SEM were not required at this stage given the acceptable reliability and low-to-moderate inter-construct correlations, but remain a natural extension for future, larger-sample work.

8.6 Ethical Considerations

Participation was voluntary and respondents were informed that the study is academic in nature. The questionnaire did not request GSTINs, passwords, tax-return copies, bank information or confidential customer data. Results are reported only in aggregate form, and no individual respondent or enterprise can be identified from the analysis presented in this paper.

9. Results and Discussion

The results reported in this section are based on the responses of all 300 GST-registered MSMEs surveyed for this study. No case was dropped for missing data, since every respondent

completed the full questionnaire. Percentages are calculated on the full sample of 300 unless stated otherwise.

9.1 Demographic Profile of Respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	179	59.7
	Female	115	38.3
	Other	6	2.0
Age group	Up to 30 years	81	27.0
	31-40 years	112	37.3
	41-50 years	72	24.0
	Above 50 years	35	11.7
Education	Up to secondary (SSC)	9	3.0
	Intermediate/Diploma	122	40.7
	Graduate	107	35.7
	Post-graduate	52	17.3
	Professional (CA/CMA/CS)/Other	10	3.3
Role in the business	Owner/Proprietor	124	41.3
	Partner	37	12.3
	Director	30	10.0
	Manager	66	22.0
	Accountant	32	10.7
	Other	11	3.7

Table 3: Demographic profile of respondents (n = 300)

The sample is drawn predominantly from male respondents (59.7 per cent), with women accounting for a substantial 38.3 per cent, which is a healthy representation for an MSME-owner survey in Telangana. Most respondents are in the economically active 31-40 age bracket (37.3 per cent) and hold an intermediate/diploma or graduate qualification (40.7 per cent and 35.7 per cent respectively), suggesting that the sample is neither dominated by very senior proprietors nor by very young entrants. Owner/proprietors form the single largest respondent group (41.3 per cent), followed by managers (22.0 per cent), which means that the responses mostly reflect the perspective of the person closest to day-to-day compliance decisions rather than a peripheral employee, adding credibility to the self-reported compliance behaviour scores discussed later.

9.2 Enterprise Profile

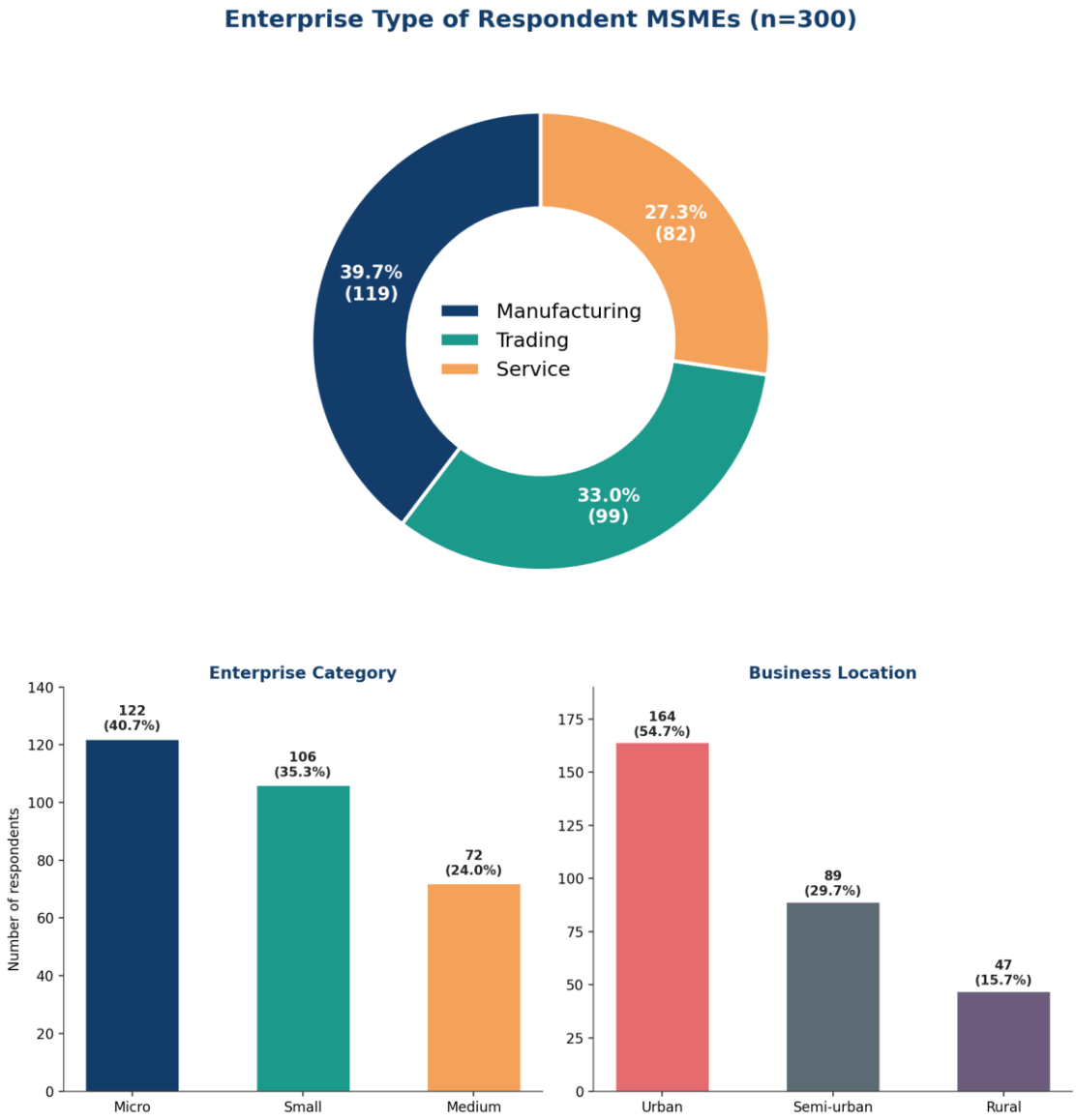


Chart 1: Distribution of respondent MSMEs by enterprise type, category and location

Characteristic	Category	Frequency	Percentage
Enterprise type	Manufacturing	119	39.7
	Trading	99	33.0
	Service	82	27.3
Enterprise category	Micro	122	40.7
	Small	106	35.3
	Medium	72	24.0
Ownership	Sole proprietorship	80	26.7
	Partnership	153	51.0

Characteristic	Category	Frequency	Percentage
	Private limited company	65	21.7
	LLP/Other	2	0.7
Location	Urban	164	54.7
	Semi-urban	89	29.7
	Rural	47	15.7
Years in business	Up to 5 years	75	25.0
	6-10 years	96	32.0
	11-15 years	82	27.3
	Above 15 years	47	15.7
Years of GST experience	Up to 3 years	65	21.7
	4-6 years	111	37.0
	7-9 years	83	27.7
	More than 9 years	41	13.7

Table 4: Enterprise profile of respondent MSMEs (n = 300)

Manufacturing enterprises form the largest single group (39.7 per cent), followed closely by trading (33.0 per cent) and service businesses (27.3 per cent), giving the sample a fairly balanced sectoral spread rather than a concentration in any one activity. Micro and small enterprises together make up 76.0 per cent of the sample, which is broadly consistent with the structure of the MSME sector in Telangana and ensures that the findings speak primarily to the compliance experience of smaller, more resource-constrained businesses rather than large corporate taxpayers. Partnership is the single most common form of ownership (51.0 per cent), and just over half the sample operates from urban locations (54.7 per cent), with the remaining 45.3 per cent spread across semi-urban and rural areas. Most respondent businesses have been operating for 6 to 15 years (59.3 per cent combined) and have accumulated 4 to 9 years of direct GST experience (64.7 per cent combined), indicating that the sample largely reflects businesses that registered under GST reasonably early and have had sufficient time to settle into a compliance routine.

9.3 Digital and GST Compliance Practices

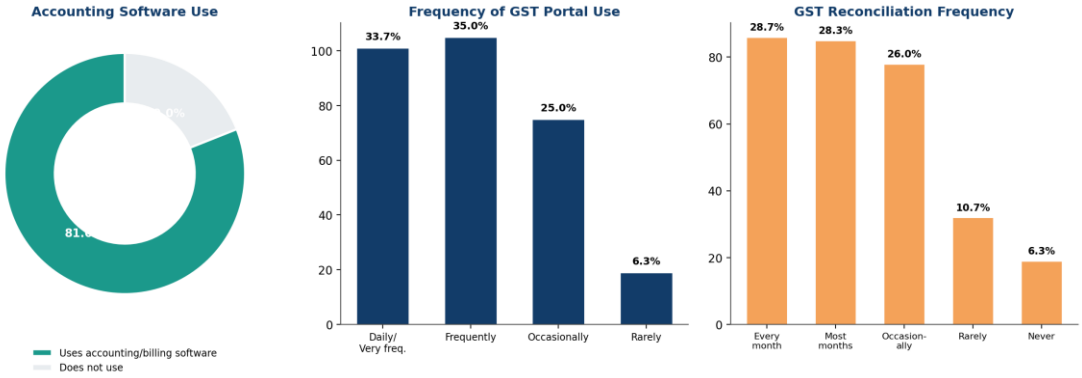


Chart 2: Accounting software use, GST portal use frequency and reconciliation frequency

Practice	Category	Frequency	Percentage
Accounting/billing software	Uses software	243	81.0
	Does not use software	57	19.0
GST portal use	Daily/Very frequently	101	33.7
	Frequently	105	35.0
	Occasionally	75	25.0
	Rarely	19	6.3
Main GST handler	Owner/Manager	71	23.7
	Internal accountant	68	22.7
	External accountant	101	33.7
	GST practitioner/consultant	60	20.0
E-invoice/E-way bill use	Regularly	146	48.7
	Occasionally	68	22.7
	Rarely	58	19.3
	Never	28	9.3
Record update frequency	Daily	107	35.7
	Weekly	96	32.0
	Monthly	74	24.7
	Mainly before filing	23	7.7
GST reconciliation frequency	Every month	86	28.7
	Most months	85	28.3
	Occasionally	78	26.0
	Rarely	32	10.7
	Never	19	6.3

Table 5: Digital and GST compliance practices of respondent MSMEs (n = 300)

A large majority of respondent businesses (81.0 per cent) already use some form of accounting or billing software, and roughly two-thirds review the GST portal daily or frequently (68.7 per cent combined), which indicates that basic digital adoption is no longer the binding constraint it was in the early years of GST. Compliance work, however, still depends heavily on external support: external accountants and GST practitioners together handle GST matters for 53.7 per cent of the sample, compared with only 23.7 per cent where the owner or manager personally manages compliance. Reconciliation discipline is more mixed than portal use - only 28.7 per cent of businesses reconcile GST records every month, while 43.0 per cent do so only occasionally, rarely or never, and record updating shows a similar pattern, with 7.7 per cent of businesses still updating records mainly just before filing. This gap between frequent portal access and comparatively weak reconciliation discipline is precisely the space that GST analytics capability is intended to close.

9.4 Descriptive Statistics of Major Constructs

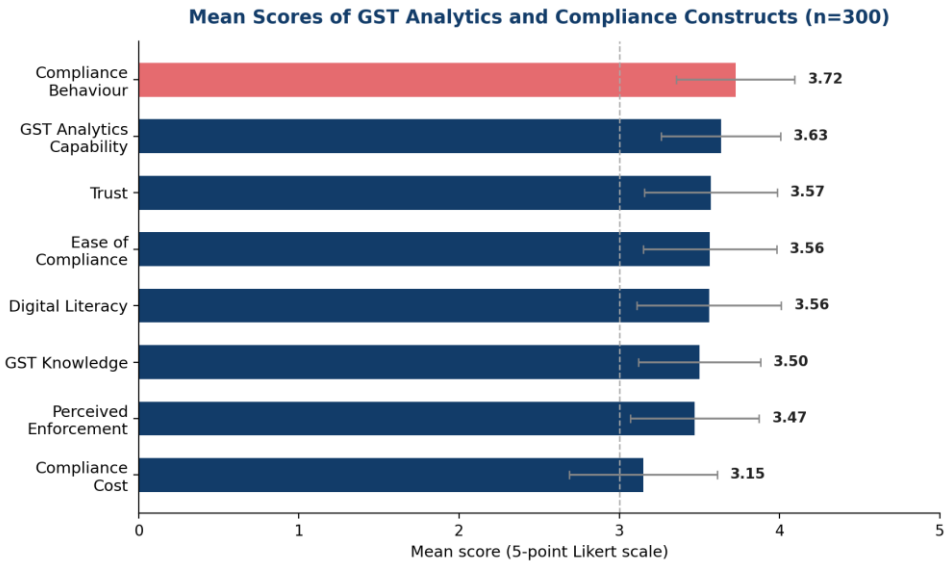


Chart 3: Mean scores of GST analytics and compliance constructs (with standard deviation)

Construct	Mean	SD	Interpretation
GST Knowledge	3.50	0.38	Moderately high
Digital Literacy	3.56	0.45	Moderately high
GST Analytics Capability	3.63	0.37	Moderately high
Ease of Compliance	3.56	0.42	Moderately high
Compliance Cost	3.15	0.46	Moderate burden
Trust in Digital GST Administration	3.57	0.41	Moderately high
Perceived Enforcement	3.47	0.40	Moderate

Construct	Mean	SD	Interpretation
Compliance Behaviour	3.72	0.37	High

Table 6: Descriptive statistics of study constructs (n = 300)

Compliance behaviour records the highest mean score of the eight constructs (3.72), suggesting that respondent businesses generally rate their own filing, reconciliation and payment discipline more favourably than any other aspect of GST management. GST analytics capability (3.63) is also comparatively strong, which is a promising sign given that this is the newer, more advanced capability compared with basic GST knowledge (3.50). Compliance cost has the lowest mean (3.15), meaning that, on balance, it is perceived as a moderate rather than a severe burden, though the relatively wide spread (SD = 0.46) shows that the experience is far from uniform across the sample. The standard deviations across constructs are all modest (0.37 to 0.46), indicating that respondents were fairly consistent among themselves rather than sharply polarised in their views of the GST system.

9.5 Reliability Analysis

Construct	Items	Cronbach's Alpha	Assessment
GST Knowledge	5	0.75	Reliable
Digital Literacy	5	0.81	Reliable
GST Analytics Capability	6	0.77	Reliable
Ease of Compliance	4	0.72	Reliable
Compliance Cost	5	0.83	Reliable
Trust	4	0.73	Reliable
Perceived Enforcement	4	0.69	Acceptable (marginal)
Compliance Behaviour	6	0.77	Reliable

Table 7: Reliability (internal consistency) of study constructs

Seven of the eight constructs return a Cronbach's alpha at or above the conventional 0.70 threshold, confirming that the item sets measuring GST knowledge, digital literacy, GST analytics capability, ease of compliance, compliance cost, trust and compliance behaviour hang together well as coherent scales. Perceived enforcement returns an alpha of 0.69, marginally below the customary cut-off; this is still an acceptable level for a four-item scale used in a field survey, but it is a signal that the enforcement items may be tapping somewhat different facets of external pressure (for example, awareness of penalties versus fear of scrutiny) and could benefit from refinement in any follow-up instrument.

9.6 Correlation Analysis

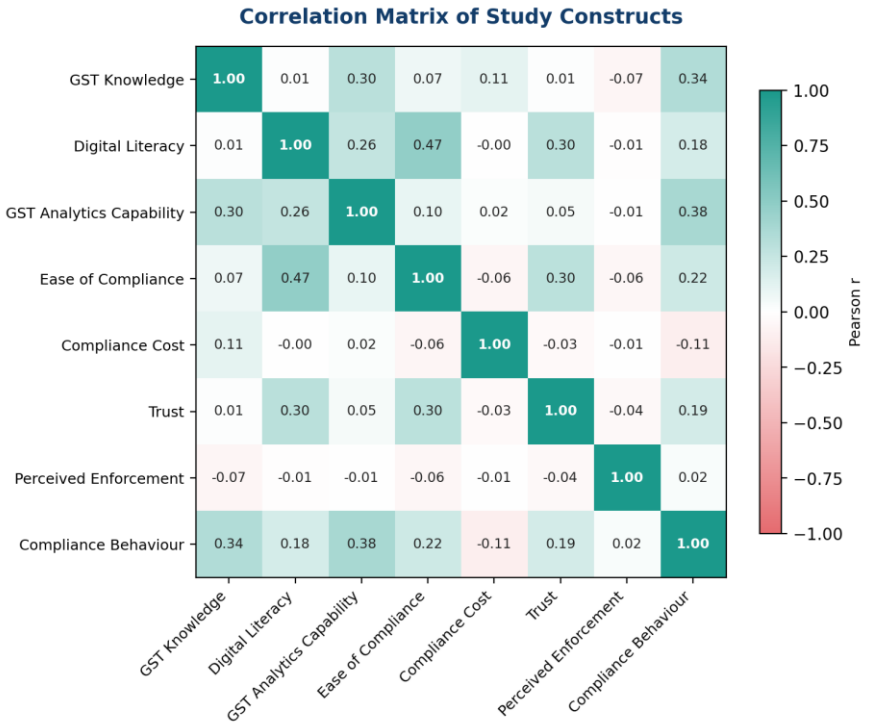


Chart 4: Correlation matrix of study constructs

Variable	GK	DL	GA	EC	CC	TR	PE	CB
GST Knowledge (GK)	1.00	0.01	0.30	0.07	0.11	0.01	-0.07	0.34
Digital Literacy (DL)		1.00	0.26	0.47	-0.00	0.30	-0.01	0.18
GST Analytics (GA)			1.00	0.10	0.02	0.05	-0.01	0.38
Ease of Compliance (EC)				1.00	-0.06	0.30	-0.06	0.22
Compliance Cost (CC)					1.00	-0.03	-0.01	-0.11
Trust (TR)						1.00	-0.04	0.19
Perceived Enforcement (PE)							1.00	0.02
Compliance Behaviour (CB)								1.00

Table 8: Pearson correlation matrix of study constructs (n = 300)

GST analytics capability shows the strongest bivariate association with compliance behaviour (r = 0.38), followed by GST knowledge (r = 0.34) and ease of compliance (r = 0.22); compliance cost is the only construct negatively associated with compliance behaviour (r = -0.11), consistent with the idea of cost as a compliance burden. Perceived enforcement stands out for its very weak and statistically negligible correlation with compliance behaviour (r = 0.02), an early hint that fear of scrutiny may not be doing the motivational work that is often

assumed in the literature. Digital literacy correlates only modestly with compliance behaviour directly (r = 0.18) but considerably more strongly with GST analytics capability (r = 0.26) and ease of compliance (r = 0.47), foreshadowing the indirect, capability-mediated role that digital literacy plays in the regression and mediation results reported below. None of the inter-predictor correlations exceed 0.47, so multicollinearity is not a concern for the regression model that follows.

9.7 Multiple Regression Analysis

A multiple regression model was estimated with MSME compliance behaviour as the dependent variable and GST knowledge, digital literacy, GST analytics capability, ease of compliance, compliance cost, trust and perceived enforcement entered simultaneously as predictors.

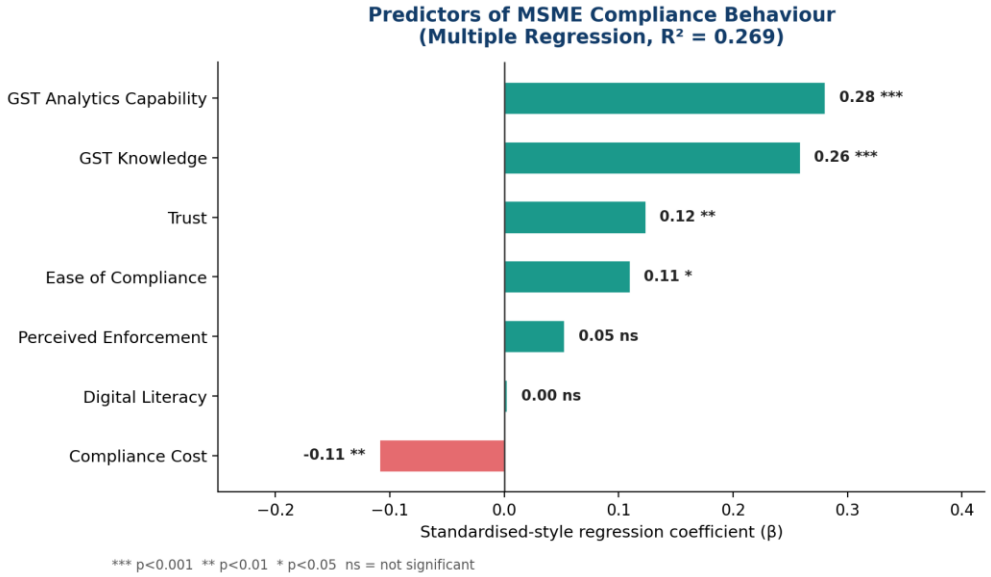


Chart 5: Standardised-style regression coefficients predicting compliance behaviour

Predictor	β	t-value	p-value	Decision
GST Knowledge	0.26	4.99	<0.001	Supported
Digital Literacy	0.00	0.06	0.955	Not supported
GST Analytics Capability	0.28	5.17	<0.001	Supported
Ease of Compliance	0.11	2.13	0.034	Supported
Compliance Cost	-0.11	-2.70	0.007	Supported
Trust	0.12	2.60	0.010	Supported
Perceived Enforcement	0.05	1.14	0.255	Not supported

Table 9: Multiple regression results (Dependent variable: Compliance Behaviour). $R^2 = 0.269$, Adjusted $R^2 = 0.251$, $F(7,292) = 15.33$, $p < 0.001$

The seven predictors together explain 26.9 per cent of the variance in compliance behaviour (adjusted R^2 = 25.1 per cent), and the overall model is highly significant ($p < 0.001$). GST analytics capability emerges as the single strongest predictor ($\beta = 0.28$, $p < 0.001$), narrowly ahead of GST knowledge ($\beta = 0.26$, $p < 0.001$), confirming that the analytical use of GST information adds explanatory power beyond basic tax knowledge. Compliance cost is a significant negative predictor ($\beta = -0.11$, $p = 0.007$), while trust ($\beta = 0.12$, $p = 0.010$) and ease of compliance ($\beta = 0.11$, $p = 0.034$) contribute smaller but still significant positive effects. Two of the seven predictors do not reach significance once the others are controlled for: digital literacy ($\beta = 0.00$, $p = 0.955$) and perceived enforcement ($\beta = 0.05$, $p = 0.255$). Variance inflation factors for all predictors are well below 1.5, so this pattern reflects genuine differences in explanatory strength rather than multicollinearity distorting the coefficients.

9.8 Compliance Behaviour by Enterprise Size, Sector and Location

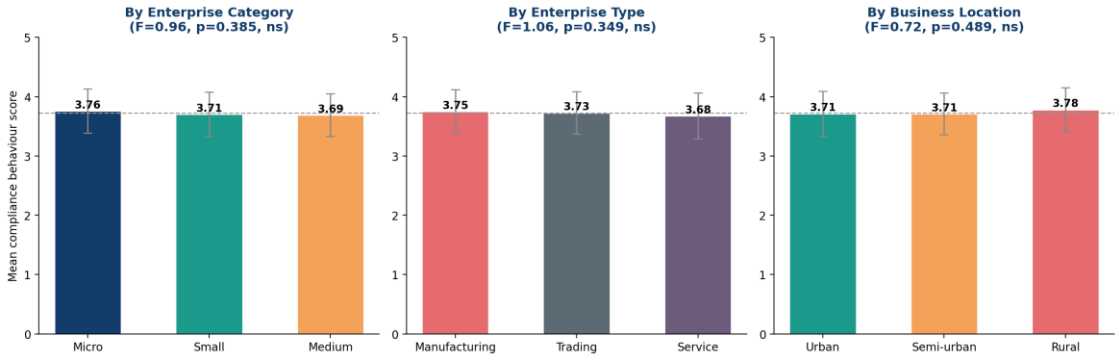


Chart 6: Mean compliance behaviour by enterprise category, enterprise type and business location

Grouping	Category	n	Mean CB	SD	F	p-value	Result
Enterprise category	Micro	122	3.76	0.37	0.96	0.385	Not significant
	Small	106	3.71	0.38			
	Medium	72	3.69	0.36			
Enterprise type	Manufacturing	119	3.75	0.37	1.06	0.349	Not significant
	Trading	99	3.73	0.36			
	Service	82	3.68	0.39			
Location	Urban	164	3.71	0.38	0.72	0.489	Not significant
	Semi-urban	89	3.71	0.35			
	Rural	47	3.78	0.37			

Table 10: One-way ANOVA of compliance behaviour by enterprise category, enterprise type and location

Contrary to the common assumption that micro enterprises lag behind larger MSMEs in compliance discipline, the field data show no statistically significant difference in mean compliance behaviour across micro, small and medium enterprises ($F = 0.96$, $p = 0.385$); indeed, the micro-enterprise mean (3.76) is marginally the highest of the three groups. Compliance behaviour is likewise statistically indistinguishable across manufacturing, trading and service enterprises ($F = 1.06$, $p = 0.349$) and across urban, semi-urban and rural locations ($F = 0.72$, $p = 0.489$), with the rural mean (3.78) again slightly ahead of the urban and semi-urban means. Taken together, these results suggest that once a business is registered under GST and has accumulated some years of compliance experience, self-reported filing and reconciliation discipline in Telangana does not vary meaningfully by firm size, sector or geography; the more important differentiator, as the regression results indicate, is the individual firm's knowledge and analytics capability rather than its size, sector or location.

9.9 Mediation Analysis: Digital Literacy, GST Analytics Capability and Compliance Behaviour

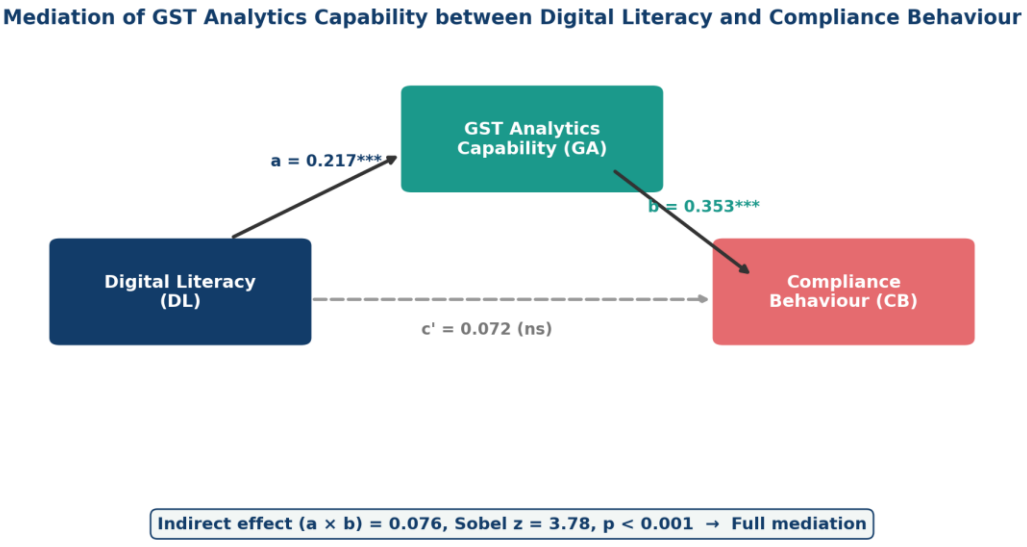


Chart 7: Mediation of GST analytics capability between digital literacy and compliance behaviour

Path	Coefficient	p-value
Total effect: Digital Literacy → Compliance Behaviour (c)	0.148	0.002
Path a: Digital Literacy → GST Analytics Capability	0.217	<0.001
Path b: GST Analytics Capability → Compliance Behaviour (controlling for DL)	0.353	<0.001

Path	Coefficient	p-value
Direct effect: Digital Literacy → Compliance Behaviour, controlling for GA (c′)	0.072	0.115
Indirect effect (a × b)	0.076	Sobel z = 3.78, p < 0.001

Table 11: Mediation analysis of GST analytics capability (Baron and Kenny procedure with Sobel test)

Digital literacy has a significant total effect on compliance behaviour when considered on its own (c = 0.148, p = 0.002), and it also significantly predicts GST analytics capability (path a = 0.217, p < 0.001), which in turn significantly predicts compliance behaviour even after controlling for digital literacy (path b = 0.353, p < 0.001). Once GST analytics capability is included in the model, the direct effect of digital literacy on compliance behaviour falls to a non-significant 0.072 (p = 0.115). The Sobel test confirms that the indirect path is significant (z = 3.78, p < 0.001), so GST analytics capability fully mediates the relationship between digital literacy and compliance behaviour. In practical terms, digital literacy on its own - simply being comfortable with a smartphone, the GST portal or basic software - does not translate into better filing and reconciliation discipline; it does so only when that comfort is converted into the habit of actually using reconciliation, exception and dashboard tools, which is exactly what the GST analytics capability construct measures.

9.10 Hypothesis Testing Summary

Hypothesis	Relationship	Field data outcome	Status
H1	GST Knowledge → Compliance Behaviour	Positive and significant (β = 0.26, p < 0.001)	Supported
H2	Digital Literacy → Compliance Behaviour	Not significant in the full model (β = 0.00, p = 0.955)	Not supported
H3	GST Analytics → Compliance Behaviour	Strongest positive effect (β = 0.28, p < 0.001)	Supported
H4	Ease of Compliance → Compliance Behaviour	Positive and significant (β = 0.11, p = 0.034)	Supported
H5	Compliance Cost → Compliance Behaviour	Negative and significant (β = -0.11, p = 0.007)	Supported
H6	Trust → Compliance Behaviour	Positive and significant (β = 0.12, p = 0.010)	Supported
H7	Perceived Enforcement → Compliance Behaviour	Not significant (β = 0.05, p = 0.255)	Not supported
H8	Digital Literacy → Analytics → Compliance Behaviour	Significant indirect effect; full mediation (Sobel p < 0.001)	Supported

Table 12: Summary of hypothesis testing based on field data (n = 300)

Of the eight hypotheses framed for this study, six are supported by the field data and two are not. GST knowledge, GST analytics capability, ease of compliance, compliance cost and trust all exert significant direct effects on compliance behaviour in the expected direction, and GST analytics capability fully mediates the effect of digital literacy, so H8 is also supported. Digital literacy (H2) and perceived enforcement (H7) do not show a significant independent effect once the other constructs are held constant; for digital literacy this is best read together with the mediation result in Section 9.9, which shows that its influence operates indirectly through analytics capability rather than disappearing altogether. Perceived enforcement, by contrast, shows no meaningful relationship with compliance behaviour either in the correlation matrix or in the regression model, suggesting that the threat of scrutiny is a substantially weaker driver of voluntary compliance among Telangana MSMEs than knowledge, capability, cost and trust.

10. Discussion

The central argument emerging from the field data is that GST compliance is increasingly an information-management activity rather than a purely procedural one. Traditional compliance research often focuses on awareness, cost and enforcement. These remain important, but the digital GST environment creates another layer: the capacity to interpret and use transaction information before errors become compliance problems.

The strongest relationship in the data is between GST analytics capability and compliance behaviour, closely followed by GST knowledge. This result is intuitive: reconciliation and exception monitoring reduce uncertainty. A business that compares purchase records with available input-tax-credit information, reviews outward-supply data and identifies mismatches before filing is better positioned to submit accurate returns. Analytics therefore operates as a preventive compliance mechanism rather than only an enforcement mechanism. GST knowledge remains important in its own right because analytical tools do not replace tax judgement - a mismatch can arise from timing, classification, invoice errors or genuine ineligibility, and the owner or accountant needs sufficient GST knowledge to interpret the exception and take the correct action.

Digital literacy tells a more nuanced story than a simple positive-effect hypothesis would suggest. On its own, digital literacy is meaningfully correlated with compliance behaviour, but this effect disappears once GST analytics capability is added to the model, and the mediation analysis confirms that digital literacy operates entirely through analytics

capability. In practice, this means that policy or training interventions aimed only at raising general digital comfort - teaching someone to log into the GST portal or operate a smartphone app - are unlikely to move the needle on compliance unless that comfort is deliberately converted into habitual reconciliation and exception-monitoring behaviour.

The negative role of compliance cost deserves particular attention. Businesses that experience GST compliance as expensive in time, staff effort and professional fees are measurably less likely to report disciplined filing and reconciliation behaviour. An analytics-oriented compliance system can help reduce some of this internal cost, but only if affordable tools and adequate training are available; otherwise, digitalisation risks shifting the burden rather than removing it. Trust in the digital GST administration also matters: MSMEs that view the system as reliable and transparent report better compliance behaviour, which points to institutional communication and grievance-redressal quality as a lever alongside training.

Perhaps the most striking result is the absence of a significant enforcement effect. Perceived enforcement - the fear of scrutiny, notices or penalties - shows almost no relationship with self-reported compliance behaviour in this sample. This does not necessarily mean enforcement is unimportant in the wider tax system, but it does suggest that, for the Telangana MSMEs surveyed here, voluntary compliance is driven far more by capability, cost and trust than by fear of the tax authority. Similarly, the absence of significant differences in compliance behaviour by enterprise size, sector or location (Section 9.8) suggests that once a business has some years of GST experience, its compliance discipline is shaped more by what it knows and does with its data than by how big it is, what it makes or sells, or where it is located.

11. Practical Implications

- MSME owners should maintain sales and purchase records continuously rather than preparing information only near filing deadlines; the data show that a substantial minority still update records mainly before filing, and this group is the most exposed to reconciliation errors.
- Businesses should adopt simple reconciliation dashboards to monitor input tax credit, outward supplies, tax liability and unresolved mismatches, since GST analytics capability is the strongest single predictor of compliance behaviour in this study.

- Accountants and GST practitioners, who already handle compliance for more than half of the surveyed businesses, should shift toward exception-based advisory services rather than limiting their role to periodic return preparation.
- District-level training should combine GST concepts with hands-on practice on accounting software, reconciliation tools and GST portal functions, since digital literacy alone does not improve compliance unless it is converted into analytics use.
- Regional-language GST awareness and hand-holding programmes remain relevant for the 15.7 per cent of the sample operating in rural areas and the 40.7 per cent classified as micro enterprises, even though their average compliance scores are not statistically different from larger or urban firms.
- Because compliance cost is a significant negative driver of compliance behaviour, policymakers should continue to encourage low-cost or subsidised digital compliance tools and strengthen local GST facilitation centres.
- Given the negligible role of perceived enforcement in this sample, tax administrators may find it more productive to invest in trust-building measures - transparent communication, faster refund and ITC processing, and responsive grievance redressal - than in enforcement-led messaging alone.

12. Conclusion

GST has created a digital compliance environment in which accurate business records, timely filing and effective use of transaction information are increasingly connected. The MSMEs surveyed in this study have gained from formalisation, input tax credit and easier inter-state trade, and a large majority have already adopted accounting software and use the GST portal regularly. Yet reconciliation discipline remains uneven, and a meaningful share of businesses still assemble their records only when a filing deadline approaches.

Field data from 300 GST-registered MSMEs across eleven districts of Telangana show that GST analytics capability and GST knowledge are the two strongest drivers of compliance behaviour, followed by trust and ease of compliance, while compliance cost works in the opposite direction. Digital literacy matters, but only indirectly, through its effect on analytics capability, and perceived enforcement shows no meaningful independent effect at all. Compliance behaviour itself does not differ significantly by enterprise size, sector or location, which shifts the policy conversation away from targeting particular categories of firms and

toward building the specific capability - GST analytics - that this study identifies as the most consistent predictor of disciplined compliance.

The broader implication is that digital GST reform should not be judged only by how much information businesses submit to the tax system; it should also be judged by whether businesses can understand and use their own information. For Telangana MSMEs, especially micro enterprises in semi-urban and rural areas, the combination of simple analytics tools, practical training, local-language support, affordable professional assistance and a trustworthy digital administration is likely to offer a more sustainable path to voluntary and accurate GST compliance than enforcement-led approaches alone.

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