Title: A study on benefits of data analytics tools in indirect tax administration and management – with reference to GST in India

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Received: 10.01.2025 Accepted: 01.03.2025 Publishing: 16.05.2025 Doi: 10.56334/sei/8.4.79[1]

Abstract

Purpose: The purpose of this study is to examine the benefits of various data analytics tools in indirect tax administration and management especially in the Indian context. The other purpose of this paper is grouping the overall benefits of data analytics in managing indirect taxes.

Design/Methodology/Approach: Reports of various companies specializing in tax audit has been used to strongly establish the background for this study. The study adopted survey design where around 100 tax professionals were selected on convenient basis to examine the benefits of data analytics in tax administration. The collected primary data were analysed with the help of IBM SPSS25 software and descriptive statistics & Exploratory Factor Analysis was used to generate the results.

Findings: The study finds that data analytics proves to best option for managing indirect taxes with growing digitalization and industry 4.0. The study has grouped overall benefits of data analytics in three components namely tax administration and management, fraud detection and monitoring.

Research limitations/Implications: It is better recommended to use data analytics tools to ensure quality services for tax payers as well to have tax control and preventing fraudulent practices due to loop holes in the system.

Originality/value: Studies related to tax and technology was quite common in foreign literature and not much in Indian context. This study is unique because it attempts to examine the benefits of data analyt-

Citation: Mr. Gowtham R., Dr. Chitra S. (2025). A study on benefits of data analytics tools in indirect tax administration and management – with reference to GST in India *Science, Education and Innovations in the Context of Modern Problems*, 8(4), 744-754; doi: 10.56352/sei/8.4.79. https://imcra-az.org/archive/362-science-education-and-innovations-in-the-context-of-modern-problems-issue-4-volviii-2025.html

ics in taxation through survey of tax professional thereby providing empirical evidences for further studies in this domain.

Keywords: Data analytics, Goods and Services Tax, Enterprise Resource Planning, Business Intelligence, Tax Administration and Management.

Introduction

The origins of data analytics may be traced all the way back to the early 1950s, when corporations spent a significant amount of time collecting data, resulting in less time for analysing and acquiring the findings. Additionally, this time is defined by a scarcity of data sources and works that were mostly manual in nature. All of these obstacles contributed to the emergence of the data analytics age. Another watershed moment in data science occurred in the early 2000's. The phrase "big data" was invented during this time period. This stage of data analytics is defined by businesses establishing digital infrastructure capable of processing vast amounts of data and producing useful results. In the early and mid-2000's, technologies such as OLAP, data mining, and others were invented that advanced technical breakthroughs to the next level. On that note, "internet" grew in popularity and was added to the list of "Must haves" not only for businesses, but also for homes. With the advancement and maturation of technology, and the availability of automated data management alternatives, data analysts found themselves in a much better position. They could now analyse data, trends, and other factors in unprecedented detail and come up with findings and suggestions. This age bestowed to us Google, PayPal, and Amazon, among other things. Additionally, as the amount of data increased, storage and processing became an issue. The late 2000's and early 2010's witnessed the emergence of smartphones, Facebook, Twitter, and other linked devices in data science. To attract consumers, businesses used improved search engines, recommendations, and suggestions, all of which were powered by data-driven analytics. Here, we witnessed the establishment of "Online Analytical Processing" platforms by industry leaders (firms). Recognizing that businesses would need to deal with unstructured data as well, they became acquainted with a new class of databases called NoSQL. For advanced analytics, new technologies were implemented to enable quicker processing and machine learning models were employed. This cleared the path for the establishment of a necessity for data scientists. We are now at the 4.0 phase, which means that organisations are one step ahead of the competition in terms of deploying advanced automated decision-making tools based on cloud and big data technology, as well as predictive analytics. It is now feasible to offer huge streaming and complicated analytics using top cloud platforms. In general, data analytics is classified into four types: predictive analytics, prescriptive analytics, diagnostic analytics, and descriptive analytics. The most often utilised subset of data analytics is predictive analytics. Predictive analytics is used by businesses to discover trends, correlations, and causality. The category may be further subdivided into predictive modelling and statistical modelling; nevertheless, it is critical to understand that the two are mutually exclusive. Prescriptive analytics combines AI and large data to assist in predicting outcomes and determining the appropriate course of action. This analytics area may be further subdivided into optimization and random testing. While not as thrilling as forecasting the future, analysing historical data may be critical in steering your organisation. Diagnostic data analytics is the process of analysing data in order to determine the cause and effect of an event or to determine why something occurred. Drill down, data discovery, data mining, and correlations are often used techniques. Diagnostic data analytics assists in determining the cause of an event's occurrence. Diagnostic data analytics is used to "find" facts about your firm, such as the best qualified applicant for a new job. Without descriptive analytics, reporting would be impossible business intelligence (BI) tools and dashboards would be unattainable. It responds to fundamental queries such as "how many, when, where, and what." Additionally, descriptive analytics may be classified into two types: ad hoc reporting and prepared reports. A canned report is one that has been pre-designed and includes data on a certain topic. On the other hand, ad hoc reports are created by you and are often not planned. They are created in response to a business

need for a solution to a particular business inquiry. These reports are beneficial for collecting further information about a particular query. An ad hoc analysis might concentrate on your company's social media presence, investigating the sorts of individuals who like your page and others in your sector, as well as other interaction and demographic data. Its hyper-specificity assists in providing a more comprehensive image of your social media audience.

Tax Administration is defined as the administration, management, conduct, direction, and supervision of the administration and application of the state's tax laws. It includes the development and formulation of tax policy relating to existing or proposed state tax laws, and includes the assessment, collection, enforcement, litigation, publication, and statistical gathering functions imposed by such laws. Modern tax administrations operate on a shoestring budget and know that properly enforcing each taxpayer's duties is an expensive endeavour. Rather than 'policing' tax compliance, contemporary tax administrations prioritise three primary goals: encouraging voluntary compliance, monitoring compliance selectively, and enforcing compliance selectively. Modern tax administrations enable voluntary compliance by streamlining procedures, offering information, education, and assistance to taxpayers, and allocating their limited compliance monitoring and enforcement resources to regions posing the highest revenue risk. They use a risk-based approach to compliance risk management, recognising the existence of a range of compliance behaviours and the possibility to develop constructive relationships with taxpayers. This risk management technique is built to detect, analyse, rank, and address tax compliance risks in a systematic manner by segmenting taxpayers into compliance groups and designing distinct solutions to the elements affecting compliance in each group. This approach emphasises the need of tax administrations being prudent with their limited resources. Rather of enforcing compliance throughout the compliance risk spectrum, tax administrations prioritise enforcement in high-risk areas and encourage voluntary compliance in other areas. Tax administrations use information technology to monitor taxpayer accounts and an audit method to discover noncompliance while monitoring compliance. A highly visible audit programme is critical for ensuring that taxpayers understand the penalties of noncompliance and are exposed to them. A revenue-focused audit approach not only maximises the return on the limited audit and other compliance resources available, but also promotes voluntary compliance by minimising the tax administration's intervention into the affairs of compliant taxpayers. Historically, tax administrations have depended on judicial remedies to ensure taxpayer compliance. Tax administrations nowadays place a premium on enabling and promoting voluntary compliance. Where appropriate, however, the full force of the legal system is brought to bear on noncompliant taxpayers, therefore establishing some degree of consistency in the execution of the law and fostering a sense of justice among taxpayers.

GST is a consumption tax on products and services but not alcoholic drinks for human consumption. Five petroleum goods are exempt from GST and will be reintroduced later. CGST is collected when goods and services are delivered inside state/union territory. A similar IGST is levied on imports into India. (Comptroller and Auditor General 2019).

The Central Board of Indirect Taxes and Customs (CBIC10) and the Central Board of Direct Taxes (CBDT) are both statutory boards formed under the Central Board of Revenue Act, 1963. The CBIC is in charge of GST levy and collection. The CBIC regulates indirect taxes via field offices. The CBIC restructured its field offices into 21 GST Zones overseen by the Principal Chief Commissioner/Chief Commissioner. The Principal Commissioner/Commissioner leads the 107 GST Taxpayer Services Commissionerate responsible for GST and CES. Deputy/Assistant Commissioners or Superintendents lead divisions and ranges. Also, there are 49 GST Appeals Commissionerate, 48 GST Audit Commissionerate, and 22 Directorates responsible for specialised responsibilities such as DG (Systems) for managing information technology projects and DG (NACIN)11 for training needs (Comptroller and Auditor General 2019).

The primary use of information technology in tax administrations has been to support the essential tax administration functions of processing returns and payments and gathering pertinent data. Contemporary IT systems' 'core tax' component continues to support these duties, allowing the tax administration to shift away from intensive manual processing and focus on facilitating, monitoring, and enforcing compliance. Today, information technology also aids voluntary compliance by providing taxpayers with many interactive and electronic channels. This component of current information technology systems, nicknamed the 'etax system,' may comprise electronic registration, filing, payment, and information distribution, among other activities. In terms of compliance monitoring and enforcement, current IT systems compliance performance system' assists the tax administration's audit and collection functions in gathering and organising information to target areas where noncompliance offers the biggest revenue risk. Additionally, like with any company, the management information system' (MIS) component of contemporary IT systems enables decision-making by providing managers and workers with the appropriate information.

Review of literature

(Lin et al. 2021) introduced Tax Themis, an interactive visual analytics solution that allows tax inspectors to mine and explore suspicious tax evasion groups by analysing heterogeneous tax-related data in this study. Tax Themis are rich visualisations based on profit and topological data analysis. They graphically depict money transfer via related party transactions by using a calendar heatmap and well-developed encoding mechanism. A taxpayer network is developed and linked to the relevant trade network in order to detect dubious RPTTE groupings.

(Venturini and Chaim 2021) examined strategies to improve the selection of taxpayers to be inspected by projecting the results of future audits based on the results of previous audits. Choosing variables for models was made easier by reading about other people's work and looking at process information from auditors who worked with taxpayers and businesses. These two sources of information helped to figure out how to make the models and how to train them. Predictive models were made using logistic regression and neural networks. These models were able to identify groups of companies that made up about half of the audited companies and that made up more than 80% of the credit. This means that these models could help people use their resources more efficiently and get more out of them.

(Abedin, Kabir Hassan, et al. 2021)combined feature transformation as a unique subject of research for predicting corporate enterprises' tax status with the applicability of machine learning methodologies. Using machine learning to identify non-default tax corporations was effective in differentiating them from default tax enterprises, according to researchers at the University of Helsinki. Tax administration should use the most effective machine learning approach and feature transformation method based on the findings, they suggest.

(Rojszczak 2021) Polish researchers have published a study looking at the impact of STIR on privacy and data protection in the fight against tax fraud. The findings of this study are important for other countries that are implementing STIR-like systems, as well as EU institutions seeking cross-national collaboration.

(Abedin, Chi, et al. 2021)adopted automatic method to predict tax default in order to address the economic impact of unpaid taxes. Both classic feature transformation techniques and cutting-edge machine learning methodologies are used in this research. An autonomous tax default prediction system could aid administrators in attaining long-term government expenditure allocations and revenue growth. Their findings show that feature adjustments like logarithmic and square-root transformations boost the ability to estimate tax defaults substantially. They also show that the equity ratio, liquidity ratio, and debt-to-sales ratio are the most relevant predictors of tax defaults.

(Adamov 2019) presented a conceptual approach to developing a theoretical and methodological framework for the use of data analytics in taxation. It is explained how tax authorities might use their operational data to their advantage. The primary conditions for effective Advanced Data Analytics implementation are outlined.

(Mehta, Mathews, Kasi Visweswara Rao, et al. 2019)In most countries, tax avoidance is rampant. It obstructs the country's economic prosperity. We offer a strategy for spotting groups of persons who participate in GST evasion by manipulating their sales and (or) purchases in order to reduce their tax due in this study. They do cluster analysis on a number of very sensitive factors pertaining to each dealer in particular. Then, by comparing the number of dealers in each cluster, we identified questionable dealers, who were then further analysed using additional sensitive data. This project was developed for the Indian state of Telangana.

(Mehta, Mathews, Kumar, Suryamukhi, Babu, et al. 2019)discussed how big data analytics, Android apps, and information technology were used to combat tax evasion. This project was intended for the commercial taxes department of the Telangana government. They came up with a whole software framework for looking into suspect accounts. This tool helps you find suspicious vendors and standardise the process of checking your account. It does this by looking for certain things. They used powerful statistical and machine learning techniques to figure out who was going to be a bad seller. They came up with a regression model for figuring out who will come back and Android apps that are easy for police to use to get information. Another thing we looked into was how to find and analyse a tax evasion technique called "circular trading." We used sophisticated algorithmic and social-network analytic tools to do this.

(Mehta, Mathews, Kumar, Suryamukhi, Sobhan Babu, et al. 2019) describes how big data analytics can be used to detect illicit transactions carried out by fraudulent communities of people who engage in a well-known tax evasion activity known as circular trading. This strategy was devised and implemented for the Telangana government's commercial taxes department. This issue can be solved in two ways. The problem is first framed as identifying fraudulent communities in a social network, with the vertices representing dealers and the edges representing sales transactions. Step two detects illicit transactions by removing certain sorts of cycles from each fraudulent community detected in step one. The RHadoop framework was used to accomplish this strategy.

(Santos, Laureano, and Albino 2018)focused on big data analytics utilising Microsoft Business Intelligence (BI) tools. Microsoft's Power BI and Excel add-ins were used to examine how tax professionals might use data from their ERP systems to maximize value added tax recovery. The tools were applied to accounting and tax data pulled from an ERP system by combining the storage and pre-processing functions of Microsoft's relational database with the analytic functions of Excel.

(Abrantes and Ferraz 2017) This paper does a comprehensive literature analysis with the goal of finding main research that address the detection of tax fraud using big data. This evaluation discovered 56 papers, 5 of which were designated as main studies. A summary of the findings is provided, organised by the research that address the issue via the use of pattern recognition techniques, natural language processing, and data analytics in auditing. The findings also show the methods and models that were employed in each solution.

(Pijnenburg and Kowalczyk 2016)explained how analytics can be used to improve taxpayer oversight (also known as compliance risk management for tax administrations). Risk identification, risk analysis, prioritisation, treatment, and evaluation are all important duties in taxpayer monitoring.

Objectives of the study

1. To study the tax professionals' perspectives on benefits of ETL, Business Intelligence and Data Warehouse in managing GST.
2. To identify the benefits of ERP in GST management.
3. To group the various benefits of data analytics in GST administration and management.

Research methodology

This study is based on survey research methodology. Tax professionals were the respondents of this study and were chosen based on convenience sampling. The total sample size for this study is 100. The data collection instrument is questionnaire consisting of 15 statements related to benefits of data analytics in GST administration and management.

Results and Discussion

Table 1 Benefits of ETL, Business Intelligence and Data Warehouse in managing GST

	N	Minimum	Maximum	Mean	Std. Deviation
Better Collaboration Space	100	3.00	5.00	4.3667	.55605
Workflow and Process Management	100	2.00	5.00	4.1333	.81931
Enhanced Documentation and Information Management	100	3.00	5.00	4.3333	.66089
Better management of tax operations	100	2.00	5.00	4.1667	.83391
Availability of Tax Ready Format Data	100	3.00	5.00	4.4333	.67891
Valid N (listwise)	100				

Source: Primary Data Analysis

The table 1 shows the tax professionals perspectives on ETL, Business Intelligence and Datawarehouse in managing GST system. From the above table it is very clear that, these data analytics tools provide tax administrators and managers with readily available data in the necessary for processing tax claims. Secondly, these tools also provide better collaborative space for tax authorities to interact with tax payers and the same has been supported with a mean score of 4.36667. Thirdly, these tools are used for better documentation and information storage of tax payers with highest mean of 4.333. The other benefits of these data analytics tools include better management of work flow, process and tax operations which were supported by the mean scores of 4.1667 and 4.1333 respectively.

Table 2 showing Benefits of ERP in Managing GST

	N	Minimum	Maximum	Mean	Std. Deviation
Tax Sensation	100	2.00	5.00	4.2333	.72793
Tax Data Management	100	2.00	5.00	4.3667	.76489
Tax Data Mapping	100	2.00	5.00	4.2333	.77385
Web based process and management system	100	2.00	5.00	4.2667	.90719
Better Consolidation and E-Filing	100	2.00	5.00	4.4000	.72397
Valid N (listwise)	100				

Source: Primary Data Analysis

The table 2 shows the tax professionals perspectives on benefits of Enterprise Resource Planning (ERP) in managing GST system. From the above table it is very clear that, ERP provides better consolidation and e-filing facility which will enhance the tax performance. It has highest mean score of 4.40. Further, ERP also facilitates in better management of tax data like list of tax payers, their turnovers, frequency tax payments etc with a mean score of 4.3667. Thirdly, ERP also provides with web-based process and management system that enhances compliances with tax policy and procedures by tax payers and the same is supported by the mean score of 4.267. The other benefits of ERP include tax sensation and tax data mapping which were supported by the mean scores of 4.233 respectively.

Table 3 - KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.679
Bartlett's Test of Sphericity	Approx. Chi-Square	446.077
	Df	105
	Sig.	.000

Source: Primary Data Analysis

The table 3 shows KMO and Bartlett's Test of Sampling Adequacy. The standard criteria for KMO test are 0.600. In this study, KMO Value is 0.679, indicating data is good enough to proceed for exploratory factor analysis.

Table 4 - Communalities

	Initial	Extraction
Improved Tax Collections	1.000	.605
Increased Transparency and Information Sharing	1.000	.705
Facilitate Tax Audit	1.000	.726
Improved Tax Control Framework	1.000	.825
Enhanced Scrutiny of Stakeholders and Reputational Risk	1.000	.683
Manage Tax Controversy	1.000	.842
Automated Workflow	1.000	.890
Increased Centralization of Activities	1.000	.852
Maximize Return on Investment from finance function transformation	1.000	.657
It helps in plugging leakages in tax system	1.000	.735
Facilitate in Identifying economic trends	1.000	.756
Supports in focused economic policy making	1.000	.636
Identification of Fake ITC Claims and Bills	1.000	.832
Gives Real Time GST Collection Figures	1.000	.850
Gives Real Time GST Collection Figures	1.000	.834
Extraction Method: Principal Component Analysis.		

Source: Primary Data Analysis

The table 4 shows Communalities. The standard criteria for communalities is that variables used should have value greater than 0.500. In this study, all the variables have communalities value greater than 0.50 thereby supporting data validity for conducting factor analysis.

Table *5* - Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Vari-ance	Cumulative %	Total	% of Vari-ance	Cumulative %	Total	% of Vari-ance	Cumulative %
1	9.030	60.199	60.199	9.030	60.199	60.199	4.240	28.267	28.267
2	1.228	8.184	68.383	1.228	8.184	68.383	3.668	24.450	52.717
3	1.172	7.813	76.195	1.172	7.813	76.195	3.522	23.479	76.195
Extraction Method: Principal Component Analysis.									

Source: Primary Data Analysis

The table 5 shows Total Variance Explained. Total Variance Explained indicates that 76.195% of the variance is explained by each component generated.

Table 6 - Rotated Component Matrix[a]

	Component		
	Tax Administration and Management	Fraud Detection	Tax Monitoring
Improved Tax Control Framework	.859		
Improved Tax Collections	.743		
Manage Tax Controversy	.674		
Increased Centralization of Activities	.655		
Maximize Return on Investment from finance function transformation	.592		
Supports in focused economic policy making	.587		
Facilitate in Identifying economic trends	.544		
Gives Real Time GST Collection Figures		.899	
Gives Real Time GST Information		.708	
Increased Transparency and Information Sharing		.655	

It helps in plugging leakages in tax system		.626	
Enhanced Scrutiny of Stakeholders and Reputational Risk		.603	
Automated Workflow			.877
Identification of Fake ITC Claims and Bills			.795
Facilitate Tax Audit			.705
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 7 iterations.			

Source: Primary Data Analysis

The table 6 shows Rotated component matrix. The Exploratory factor analysis based on Eigen value greater than 1 generated 3 three components as major the benefits of data analytics in managing GST. These components were labelled as Tax administration and management, Fraud Detection and Transparency. The factor grouped under Tax administration and management includes tax control, tax collections, managing tax controversy, increased centralisations, maximizing returns, predicting economic trends and facilitate in the decision-making process. The factors grouped under fraud detection includes Real Time GST Collection Figures, Information, Increased Transparency and Information Sharing, plugging leakages in tax system and Enhanced Scrutiny of Stakeholders and Reputational Risk. Final factor tax monitoring includes Automated Workflow, Identification of Fake ITC Claims and Bills and Facilitate Tax Audit.

Conclusions and Recommendations

With globalization and complicated tax transactions flowing across the nation, the need for data analytics in tax computation have increased. Furthermore, on-going pandemic has forced tax authorities to equip themselves to perform GST audits effectively. Thus, to be proactive, tax authorities needed the support of various data analytics tools like data warehouse, business intelligence. Thus, this study recommends use of data analytics as tool to measure GST objectives and contributes of effective realization of GST calculations and collections. The study further also recommends multidisciplinary team (tax and technology) to showcase willingness and capability in managing GST in India.

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