The Influence of Big Data, Compliance Risk Management, and Business Intelligence on Tax Compliance

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ABSTRACT	ARTICLE INFO
Advances in information technology have brought significant changes to various sectors, including tax administration. The use of technologies such as Big Data, Compliance Risk Management (CRM), and Business Intelligence (BI) is believed to improve taxpayer compliance by analysing large amounts of data and managing tax risks more effectively. This study aims to analyse the influence of Big Data, CRM, and BI on tax compliance levels in Indonesia. A quantitative approach was used, with data collected through questionnaires from Account Representatives at the Regional Office (Kanwil) of the Directorate General of Taxes (DJP) West Java I (Jabar I). The data was analysed using the Partial Least Squares Structural Equation Modelling (PLS-SEM) model. The results of the study indicate that all three variables have a significant influence on tax compliance, with CRM as the dominant factor influencing taxpayer compliance. This study contributes to the development of technology-based taxation strategies and policy recommendations for tax authorities in improving tax management efficiency in the digital era.	

INTRODUCTION

In the digital era, information technology has become a crucial element in supporting organisational transformation. The use of big data in organisational operations is increasingly inevitable, presenting both opportunities and challenges, especially in risk management (Shi, 2022). *Big Data,* with its characteristics *of volume, velocity, variety, veracity,* and *value*, plays a key role in large-scale processing (Puspita *et al.,* 2023). Previous studies have shown that the adoption of modern information technology, such as the Golden Tax Project III (GTP III) in China, can improve corporate tax compliance. However, challenges such as infrastructure limitations, human resources, and system integration remain obstacles (Li *et al.,* 2020). China's tax reform efforts through regulatory improvements, infrastructure strengthening, and data collection optimisation demonstrate that technology plays a crucial role as a catalyst for tax system transformation (Shi, 2022).

The development of the taxation sector in Indonesia has experienced rapid growth, despite still facing complexities in optimising state revenue (Artiani, 2024). In response to these complexities, the Directorate General of Taxes (DJP) utilises big data to analyse social media, tax reports, and account data to detect tax non-compliance and support data-driven decision-making (Mukhlis *et al.,* 2024; Septiargo & Fiorenza, 2019). The success of big data implementation in taxation depends on the integration of advanced technology with effective supporting policies.

In the global taxation context, the application of conceptual frameworks such as *Compliance Risk Management* (CRM) has proven effective in supporting strategic objectives, particularly in managing taxpayer compliance risk, which focuses on identifying and managing key risks in tax compliance, from NPWP registration to payment and tax reporting (Imran *et al.*, 2022; Septiargo & Fiorenza, 2019). Despite improvements in tax data quality, oversight in Indonesia still faces challenges such as a large number of taxpayers and limited resources (Diamendia & Setyowati, 2021a). To address this, the DGT, through the Compliance Committee, is optimising the implementation of CRM with a risk-based approach, so that it can differentiate between high, medium, and low-risk taxpayers (Saptono & Khozen, 2021). However, reliance solely on CRM is considered inadequate given the complexity of taxpayer behaviour, which can lead to errors in decision-making (Arsal, 2022). Therefore, the DGT has also adopted Business Intelligence (BI) as a complement to CRM to enhance data analysis integration and effectiveness in supporting planning, resource management, and strategic decision-making (Imran *et al.,* 2022). International experiences, such as in Iraq, indicate that the implementation of BI can strengthen tax administration systems and improve the performance of tax authorities (Omrane & Al-Share, 2024). In the context of taxation, BI encompasses data analysis strategies and technologies to support more accurate and efficient management of taxpayer compliance risk in decision-making (Ledyanto, 2022).

Low tax compliance is a major challenge in optimising state revenue (Boateng *et al.,* 2022). In 2023, the national rate of Annual Tax Return (SPT) filing was 88%, which did not meet the target. The Regional Office (Kanwil) of the Directorate General of Taxes (DJP) West Java I (Jabar I) only achieved 86.3%. Some Tax Offices (KPP) under the West Java I Regional Office even recorded compliance rates below 80% (Manilet, 2024). Tax analyst from *the Center for Indonesia Taxation Analysis (*CITA), Fajry Akbar, stated that compliance among non-employee individual taxpayers is a particular concern, with a declining trend from 74% in 2018 to 69.11% in 2022. Habib Rab, an economist *at the World Bank* for Indonesia and Timor-Leste, estimated that Indonesia's tax gap reached 6% of Gross Domestic Product (GDP), attributed to excessive tax incentives and low taxpayer compliance. The low compliance rate indicates a need to optimise strategies to enhance taxpayer awareness. The government, through the DJP, has initiated several reforms, including modernising the technology-based tax system and strengthening the compliance risk management framework. These steps are expected to increase the tax ratio but also encourage the restoration of public trust in the tax authorities. (Sitorus, 2020) .

 Based on the Circular Letter of the Director General of Taxes Number: SE - 39/PJ/2021, the tax administration system continues to be developed towards a risk-based approach in service, supervision, and law enforcement. The implementation of CRM enables the DGT to manage compliance risks by treating taxpayers according to their risk levels, while BI supports more in-depth data analysis to support strategic decision-making (Hariani, 2022). The implementation of this technology is expected to increase state revenue and the quality of tax services (Imran *et al.*, 2022). The use of *big data,* CRM, and BI has become a strategic step in analysing taxpayer data, supporting tax compliance, and improving decision-making efficiency (Rahayu & Kusdianto, 2023) .

The simultaneous integration of big data, CRM, and BI is expected to improve oversight, service, and law enforcement, particularly in the digital sector such as e-commerce (Wahyudi & Kislina, 2021) . However, some studies indicate that digital transformation does not necessarily lead to significant improvements in compliance. According to Ren (2024), the efficiency gains from technology actually create opportunities for tax avoidance, especially by large and state-owned companies. Additionally, the effectiveness of CRM in the Indonesian context remains debated due to the lack of strong empirical evidence regarding its impact on compliance improvement. Research by Phinanti & Tobing (2023)

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and Muhammad & Sari (2023) states that although CRM helps in selecting taxpayers to be monitored more efficiently, there is no strong evidence to suggest that the implementation of CRM directly increases tax compliance rates. This reflects inconsistencies in previous research on the use of technologies such as *big data* and CRM to improve tax compliance. The novelty of this study lies in its integrative approach, which combines the dimensions of big data (volume, velocity, variety, veracity, value) with formal tax compliance indicators, including registration, reporting, and tax payment. It also examines the relationship between CRM variables and formal tax compliance, and reveals the need for further improvements in risk identification and data management processes to support more effective and efficient CRM implementation.

This study aims to address the gap in the literature by integrating three main *variables—big data*, CRM, and BI—into a single research model to analyse their influence on tax compliance. The novelty of this study lies in the analysis of the causal relationship between the three variables, without limiting specific sectors, such as *e-commerce,* or *digital* contexts, using data collected from Account Representatives (AR) at the West Java I Regional Tax Office. Based on this study, the focus is on the topic "The Influence of Big Data, CRM, and BI on Tax Compliance." Practically, this study aims to: First, the integration of big data technology with CRM and BI is expected to enhance efficiency in managing tax compliance risks, enabling the DJP to more effectively identify, analyse, and manage tax risks. Second, assist in designing more effective communication strategies to encourage tax compliance. Third, to support sustainable digital transformation in tax administration. The research results are expected to enrich the literature and provide practical guidance for tax authorities and other stakeholders in improving compliance in a sustainable manner.

Tax compliance is a key factor in increasing state revenue. In the era of digital transformation, technologies such as big data, Compliance Risk Management (CRM), and Business Intelligence (BI) have great potential to support tax compliance. However, the effectiveness of implementing these technologies in the context of taxation in Indonesia is still not fully understood, raising questions about the extent to which each of these technologies affects taxpayer compliance levels.

1) How significant is the impact of big data on tax compliance levels in Indonesia?
2) How significant is the impact of Compliance Risk Management (CRM) on tax compliance levels in Indonesia?
3) How significant is the impact of Business Intelligence (BI) on improving tax compliance in Indonesia?

Theoretical Framework

Big data is a collection of data that is so large, complex, and constantly growing that it cannot be managed, stored, or analysed effectively using traditional database systems. This technology leverages machine learning algorithms and advanced analytics to identify patterns, trends, and relationships within heterogeneous data (Wali *et al.*, 2022). *Big data* is significantly larger in size than the processing capacity of conventional database systems, with speeds that exceed those of traditional data or are incompatible with existing database architectures. (Puspita *et al..*, 2023) . As one of the key technologies in digital transformation, *big data* analytics (BDA) has five main characteristics known as the "5Vs": *volume, velocity, variety, veracity, and value,* which must be collected, analysed, and processed correctly to generate relevant and useful information (Imran *et al..*, 2022) .

According to Imran *et al* (2022) CRM is a conceptual framework applied by tax units in several countries to improve taxpayer compliance risk management. CRM plays an important role in supporting the achievement of strategic tax administration objectives, including optimising tax revenue and mitigating non-compliance risks. CRM functions as a structured process for the systematic identification, assessment, ranking, and management of taxpayer compliance risks (Rahayu & Kusdianto, 2023) . (Nguyen & Nguyen, 2023))

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emphasises that CRM is a risk management method aimed at maximising taxpayer compliance . By classifying taxpayers based on risk levels, tax authorities can allocate limited resources to mitigate non-compliance risks by strengthening tax audit and investigation activities. The widely used tax compliance risk management model was first developed by the European Commission and revised in 2010. This model consists of five main steps: Identification, Analysis, Ranking, Handling, and Risk Assessment (Chooi, 2020).

According to Imran *et al* (2022), Business Intelligence (BI) is a series of processes, technologies, and tools that aim to add value to data by transforming it into information and insights that can be used in an organisation's decision-making. (BI) is a series of processes, technologies, and tools that aim to transform raw data into information and insights that support data-driven decision-making. The goal is to provide strategic insights to improve operational efficiency, understand market trends, and achieve competitive advantage (Tahir *et al.,* 2023). The BI process involves collecting, storing, and analysing data from various sources to obtain competitive advantages that can be used to support decision-making (Junaedi *et* al., 2020) . BI measurement is carried out through the classification of the types of analytics used, namely descriptive, diagnostic, predictive, and prescriptive analytics, which help identify patterns, predict risks, and provide recommendations for performance improvement (Imran *et* al., 2022) .

The concept of tax compliance revolves around two aspects: (i) theoretically, it is the voluntary compliance of taxpayers; (ii) legally, it is the obligation of taxpayers to comply with tax laws and regulations (Nguyen & Nguyen, 2023). (James & Alley, 2002) define tax compliance as the willingness of individuals and entities to act in accordance with tax laws without coercion from the tax authorities. According to Rahayu (2022), tax compliance consists of formal and material tax compliance.

1. Formal tax compliance refers to taxpayers' adherence to formal tax requirements, including: timely registration to obtain a Taxpayer Identification Number (NPWP) or to be designated as eligible for a Taxpayer Registration Number (NPPKP), timely payment of taxes owed, and timely reporting of taxes paid and their calculations.
2. Material tax compliance is the taxpayer's adherence to material tax requirements, which consists of: Accurate calculation of taxes owed, Accurate calculation of taxes owed, Accurate deduction or collection of taxes (Third Party Taxpayers) (Rahayu, 2020).

Hypothesis

Big data analysis has great potential in providing business insights from various aspects, ranging from customer transactions to revenue management and investment information (Niu *et al.,* 2021). The use of big data also encourages real-time decision making. The implementation of big data faces challenges in terms of complexity and data confidentiality, especially in the context of taxation. This study analyses the problems faced by Chinese tax risk management and the successful experiences of other countries in managing tax risks using big data technology (Shi, 2022; Li *et al.*, 2020). This aligns with research (Fikriyah *et al.*, 2022; Sirait, 2016) on the DJP's use of big data technology to enhance state revenue and combat tax evasion by integrating savings account data and tax reports through social media data mining. Technologies such as data analytics, artificial intelligence ( ), and machine learning support this process by enabling the analysis of large volumes of data quickly and accurately, allowing tax authorities to detect and address violations more swiftly and effectively (Ginting *et al.,* 2024). Based on the above findings, the first hypothesis is proposed:

H1: Big data influences tax compliance.

The implementation of CRM at the DJP aims to assist the DJP in achieving its strategic organisational objectives by leveraging decision-making tools. The

implementation of CRM can help the DJP interact with taxpayers in a more fair and transparent manner, improve resource management efficiency and effectiveness, and ultimately establish a new compliance paradigm for the DJP, namely sustainable compliance (Diamendia & Setyowati, 2021b). This aligns with the research conducted by Astuti & Gunadi, 2021. Tax revenue realisation is influenced by an increase in the compliance ratio of individual taxpayers (OP) by 17% and the ratio of corporate taxpayers by 7% who reported their tax returns at the Senen Tax Office. The use of the CRM model successfully increased taxpayer compliance through an evaluation of the implementation of tax audits using the CRM model in Senen tax revenue and an evaluation of its effectiveness. The implementation of CRM is effective in achieving tax revenue and improving taxpayer compliance. Based on the previous research findings, the second hypothesis is proposed:

H2: CRM influences tax compliance.

The research conducted by (Omrane & Al-Share, 2024) The Central Bank of Indonesia (BI) supports administrative efforts to determine the level of taxpayer awareness regarding the obligation to submit tax returns by identifying the percentage of voluntary compliance and voluntary compliance rates, and seeks to modify policies and procedures if there is a decline. This indicates a positive (direct) relationship between business intelligence and tax performance, highlighting the crucial role of business intelligence in enhancing and updating administrative methods that contribute to increased tax revenue in Iraq. Additionally, findings reveal that there is a multiple influence of business intelligence dimensions (i.e., physical components, databases, communication, software, and networks) on tax authority performance. In line with research by (Junaedi *et al.,* 2020), BI applications can support decision-making by management by presenting information in a comprehensive and detailed manner. Research (Wahyudi & Kislina, 2021) explains that BI implementation is aimed at automating and maintaining added value in the compliance risk management process. These additions and improvements encourage more effective and efficient services, supervision, and law enforcement. From the results of previous research, the third hypothesis is proposed:

H3: BI influences tax compliance.

METHODS

This study uses a quantitative approach, with variables measured using research instruments so that numerical data can be analysed using established statistical procedures (Kusumastuti *et al.,* 2020). The population of this study is ARs in the West Java 1 Regional Office, consisting of 584 respondents spread across 16 Pratama and Madya Tax Offices (source: West Java I Regional Tax Office). The sampling technique used is simple random sampling. Based on Cohen's statistical power analysis table, with 3 constructs at a significance level of 5% and a minimum R^2 of 0.25, the sample size required is a minimum of 59 respondents. This is supported by the statement by (Sekaran & Bougie, 2013) who stated that the general sample size in research ranges from 30 to 500. Data collection was conducted by distributing questionnaires in hard copy and Google Forms using a 5-point Likert scale. The data obtained will be analysed using SmartPLS 4 software with a *Partial Least Squares Structural Equation Modelling* (PLS-SEM) approach to calculate the structural model and measurements, in the form of an outer model (measurement model) assessed as a based on validity tests, in the form of convergent validity and discriminant validity. Reliability tests include Cronbach's Alpha and Composite Reliability, while the Inner model (structural model) is tested using R-square, f-square, and Good of FIT values. The hypothesis test results indicate a significant influence between the research variables. Model evaluation uses SRMR to assess model fit, with the obtained values indicating that the model used is appropriate.

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The measurement variables in this study were Big data is measured using 10 (ten) questions based on the theory (Imran *et al.,* 2022) used to determine the extent of the influence of big data on tax compliance. CRM is measured using 6 (six) questions based on the theory from (Rahayu & Kusdianto, 2023) and (Nguyen & Nguyen, 2023) to determine the extent of CRM's influence on tax compliance. BI is measured using 8 (eight) questions based on the theory from (Imran *et al.,* 2022) to determine the extent of BI's influence on tax compliance. Tax compliance is measured using 3 (three) questions based on the theory from (Rahayu, 2020) to determine the level of formal tax compliance among taxpayers in the DJP Kanwil Jabar I.

RESULTS AND DISCUSSION

Instrument Validity Test

Table 1. Results of Big Data Validity Test

Question Item	BD1	BD2	BD3	BD4	BD5	BD6	BD7	BD8	BD9	BD10
rcount	0.789	0.761	0.805	0.871	0.775	0.793	0.808	0.771	0.775	0.792
Critical	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Description	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid

Source: Appendix of Validity and Reliability Test Output (2025)

Table 2. CRM Validity Test Results

Question Item	CRM1	CRM2	CRM3	CRM4	CRM5	CRM6
rcount	0.854	0.828	0.861	0.873	0.854	0.8
critical	0.3	0.3	0.3	0.3	0.3	0.3
Description	Valid	Valid	Valid	Valid	Valid	Valid

Source: Appendix Output of Validity and Reliability Test (2025)

Table 3. BI Validity Test Results

Question Item	BI1	BI2	BI3	BI4	BI5	BI6	BI7	BI8
rcount	0.797	0.739	0.753	0.858	0.692	0.781	0.835	0.82
Critical	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Description	Valid	Valid	Valid	Valid	Valid	Valid	Valid	Valid

Source: Appendix Output of Validity and Reliability Test (2025)

Table 4. Results of Tax Compliance Validity Test

Question Item	KP1	KP2	KP3
rcount	0.603	0.837	0.821
Critical	0.3	0.3	0.3
Description	Valid	Valid	Valid

Source: Appendix Output of Validity and Reliability Test (2025)

In Tables 1, 2, 3, and 4, the correlation coefficients (r) for each statement item are greater than the critical value of 0.30. These test results indicate that all questionnaire items are valid and suitable for use as a research measurement tool, enabling further analysis.

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Instrument Reliability Test

Table 5. Results of the Questionnaire Reliability Test

Questionnaire	Reliability Coefficient	Critical value	Description
Big data	0.952	0.7	Reliable
CRM	0.950	0.7	Reliable
BI	0.938	0.7	Reliable
Tax compliance	0.868	0.7	Reliable

Source: Appendix Output of Validity and Reliability Test (2025)

Table 5 shows that the reliability values of the three variables exceed the critical threshold of 0.70, indicating that the questionnaire instrument is reliable in consistently measuring the variables of big data, CRM, BI, and tax compliance.

Descriptive Analysis of Big Data

Table 6. Descriptive Statistics for Variables Based on Big Data Dimensions

No	Dimension	Statistical Measure				Relative Frequency				
		Min	Max	Average	Standard Deviation	1	2	3	4	5
1	*Volume*	2	5	4,193	0.800	0.00	4.00	12.00	44.67	39.33
2	*Velocity*	2	5	4.027	0.835	0.00	5.33	17.33	46.67	30.67
3	*Variety*	2	5	3,960	0.826	0	3.33	26.00	42.00	28.67
4	*Veracity*	1	5	4,027	0.859	1.33	2.00	21.33	43.33	32.00
5	*Value*	2	5	4,160	0.778	0.00	1.33	19.33	41.33	38.00

Source: Data processing using Excel (2025)

An analysis of the big data system at the West Java I Regional Tax Office shows that the average response score of respondents ranges from 3.960 to 4.193. This indicates that the big data system is in good condition. However, there are still aspects that need to be improved, particularly regarding the relevance and flexibility of data managed by AR at the Tax Office. According to the Head of the Data Quality Assurance Section, responsibility for data collection and management lies with the central office, covering both internal and external sources. Although a technology-based system has been implemented to present data in a structured manner, challenges still arise in terms of the specifications and relevance of the data received by the Tax Office. This indicates the need for more optimal validation and normalisation. Overall, the big data system has been functioning well. However, further development is needed to make the system more integrated and adaptive to various data formats, as well as capable of supporting risk-based analysis. These efforts are expected to improve the effectiveness of tax policies and increase taxpayer compliance.

Descriptive Analysis of CRM

Table 7. Descriptive Statistics for Variables Based on CRM Dimensions

No	Dimension	Statistical Measure				Relative Frequency				
		Min	Max	Average	Standard Deviation	1	2	3	4	5
1	Risk Identification	2	5	4,160	0.769	0	2.00	16.67	44.67	36.67

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		Min	Max	Mean	Std Dev	1	2	3	4	5
2	Risk Assessment	2	5	4.167	0.763	0	1.33	18.00	43.33	37.33
3	Risk Management & Rating	2	5	4,160	0.743	0	1.33	16.67	46.67	35.33

Source: Data processing using Excel (2025)

The results of the descriptive analysis indicate that the implementation of CRM at the Regional Tax Office of West Java I is in the good category, with an average score of 4.16. The "risk assessment" dimension recorded the highest average score (4.167), while "risk identification" and "risk handling and prioritisation" had nearly identical average scores of 4.160. Although classified as good, these results indicate room for improvement, particularly in the management of more relevant and specific data. The implementation of a more integrated and data-driven risk management system is necessary to enhance the effectiveness of risk identification, assessment, and management processes, thereby supporting the achievement of sustainable taxpayer compliance targets and strengthening the role of the DJP as a data-driven institution.

Descriptive Analysis BI

Table 8. Descriptive Statistics for Variables Based on BI Dimensions

No	Dimension	Statistical Measure				Relative Frequency				
		Min	Max	Mean	Standard Deviation	1	2	3	4	5
1	*Descriptive analytics*	2	5	4,280	0.787	0	2.67	12.67	38.67	46.00
2	*Diagnostic analytics*	1	5	4,280	0.820	0.67	2.00	13.33	36.67	47.33
3	*Predictive analytics*	1	5	4,113	0.871	1.33	2.67	16.67	42.00	37.33
4	*Prescriptive analytics*	2	5	4,227	0.761	0	2.00	14.00	43.33	40.67

Source: Data processing using Excel (2025)

The results of the descriptive analysis indicate that the implementation of BI at the Regional Tax Office of West Java I is effective, with an average score of 4.23. The descriptive analytics and diagnostic analytics dimensions received the highest scores (4.280), while predictive analytics had the lowest score (4.113). These findings indicate that historical data reporting and analysis of non-compliance causes are well-established, but predictive capabilities still need improvement. Limitations in data quality, predictive algorithms, and technology integration are the main challenges. Therefore, improving data quality, developing more accurate predictive models, and optimising the analytical system are strategic steps to strengthen oversight and promote sustainable tax compliance.

Descriptive Analysis of Tax Compliance

Table 9. Descriptive Statistics of Variables Based on Tax Compliance Dimensions

No	Dimension	Statistical Measure				Relative Frequency				
		Min	Max	Mean	Standard Deviation	1	2	3	4	5
1	Formal Tax Compliance	2	5	4,133	0.835	0.44	3.11	4.89	17.33	14.22

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Source: Data processed using Excel (2025)

The analysis indicates that formal tax compliance, such as registration, reporting, and tax payment, has a relatively high score, with timely tax reporting achieving the highest score. However, timely tax payment remains a challenge. To improve compliance, strategies such as continuous education, strengthening information technology systems, reviewing the effectiveness of administrative sanctions, providing incentives for compliant taxpayers, and implementing risk-based oversight are needed. These steps align with the risk management approach proposed by Chooi (2020) to enhance the efficiency and effectiveness of compliance management.

Verificative Analysis
Evaluation of the Big Data Latent Variable Measurement Model

Table 10. *Fornell-Larcker Criterion*

	BD	BI	CRM	KP
BD	**0.836**			
BI	0.313	**0.839**		
CRM	0.419	0.407	**0.894**	
KP	0.632	0.500	0.553	**0.889**

Source: SmartPLS Output Appendix (2025)

According to Hair *et al*. (2022), discriminant validity is problematic if the square root of AVE is smaller than the correlation between latent variables. In Table 7, the square root of AVE (***diagonal row***) is higher than the correlation between variables, indicating that each latent variable is more strongly correlated with its own indicator than with other variables, thus fulfilling the criteria for discriminant validity.

Table 11. *Heterotrait-monotrait ratio*

	BD	BI	CRM	KP
BD				
BI	0.328			
CRM	0.436	0.420		
KP	0.696	0.550	0.599	

Source: SmartPLS Output Appendix (2025)

Table 8 shows that all *heterotrait-monotrait ratio* values are less than 0.8, indicating model stability. The results of the *cross-loading* test*, Fornell-Larcker Criterion*, and *heterotrait-monotrait ratio's " "* confirm that there are no issues with *discriminant validity* in the latent variables under investigation.

Results of the Verification of the Influence Between Variables

Table 12. Results of the Verification of the Influence Between Variables

Path	Coefficient	t-stat	*p-value*	R^2	f^2	Q^2
BD => KP	0.441	3.954	0	0.552	0.348	0.408
CRM => KP	0.264	2.163	0.031		0.116	
BI => KP	0.255	2.134	0.033		0.117	

Source: SmartPLS Output Appendix (2025)

R Square shows that big data, CRM, and BI variables contribute 55.2% to tax compliance. Based on the effect size (f^2) value, big data has a medium effect on tax compliance. Meanwhile, CRM and BI have a small effect on tax compliance. The Q^2 value

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> 0.25 indicates that tax compliance has moderate predictive relevance to big data, CRM, and BI.

Model Fit

Table 13. Model Fit

	Saturated model	Estimated model
SRMR	0.075	0.075
d_ULS	2.148	2.148
d_G	2.274	2.274
Chi-square	757.396	757.396
NFI	0.687	0.687

Source: SmartPLS Output Appendix (2025)

The model evaluation results show an SRMR value of 0.075, which is below the limit of 0.08, indicating that the model has a fairly good fit (Hu & Bentler, 1999), d_G (Geodesic Discrepancy) = 2.274 d_G shows a level of discrepancy that is still within reasonable limits. Similar to d_ULS, the smaller the value, the better the model. Meanwhile, the Chi-Square value of 757.396 is relatively high, possibly influenced by the large sample size. The Normed Fit Index (NFI) value is 0.687, which is below the threshold of 0.90, indicating that the model requires improvement to achieve a more optimal level of fit.

Hypothesis Testing
The Influence of Big Data on Tax Compliance
The results of the analysis indicate that big data has a positive and significant effect on tax compliance, with a t-statistic value of 3.954 and a probability value of 0.000. Thus, the first hypothesis (H1) is accepted, meaning that big data management contributes significantly to improving tax compliance. This is consistent with the previously formulated framework, where big data is considered a key technology for analysing large datasets to identify patterns, risks, and opportunities in tax management. These results support previous studies by Fikriyah *et al.* (2022) and Ginting *et al.* (2024). This study contributes new insights by integrating descriptive and verifiable analysis to explore the impact of big data on tax compliance in the West Java I Regional Tax Office environment. However, this study also reveals challenges that need to be overcome, such as improving data quality and developing predictive technologies to support more effective decision-making. This presents an opportunity for further research to explore big data implementation strategies in taxation systems in greater depth.

The Influence of Compliance Risk Management (CRM) on Tax Compliance
The results of the verifiable analysis indicate that CRM has a positive and significant influence on tax compliance. With a t-statistic value of 2.163 and a probability of 0.031, the second hypothesis (H2) is accepted. This means that the implementation of CRM contributes to improving tax compliance. This is proven by the fact that CRM helps the DJP manage non-compliance risks in a more targeted manner, through the processes of risk identification, evaluation, and mitigation, as well as a more adaptive and humanistic risk-based approach. This study provides empirical evidence that CRM, through steps such as risk identification, risk assessment, and risk management, plays an important role in improving overall taxpayer compliance. In line with previous studies, Astuti & Gunadi (2021) and Darmayasa *et al.* (2022) argue that risk-based CRM optimisation is effective in mitigating taxpayer compliance risks during the pandemic. However, this study also reveals the need for further improvement in the risk identification and data management processes to support more effective and efficient CRM implementation.

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The results of the verification analysis indicate that BI has a positive and significant influence on tax compliance. With a *t-statistic* value of 2.134 and a probability of 0.033, this finding confirms that the third hypothesis (H3) is accepted. This means that the implementation of BI supports an increase in taxpayer compliance through more accurate, efficient, and strategic data-based decision-making. These results are consistent with the previously formulated framework, where BI was identified as an important tool to support data management, risk analysis, and the implementation of tax policy strategies. With BI, the DGT can integrate various data sources to analyse taxpayer behaviour, predict potential non-compliance, and provide more effective recommendations for action. The findings of this study are consistent with those of Omrane & Al-Share (2024). This study also supports the findings of Wahyudi & Kislina (2021), which emphasise the important role of BI in strengthening tax supervision and enforcement. The DGT can improve the effectiveness of tax supervision and management. However, this study also highlights the need for improved data quality and the development of predictive technology to support more accurate and strategic decision-making. Further research could explore optimal BI strategies to address these challenges and support more sustainable tax compliance.

CONCLUSION

This study shows that the integration of big data, Compliance Risk Management (CRM), and Business Intelligence (BI) significantly influences tax compliance, particularly in the context of digital transformation at the West Java I Regional Tax Office. These three variables synergistically support the strengthening of technology- and data-based tax administration systems. Effective big data management, particularly in terms of volume and value, enables in-depth analysis of taxpayer compliance patterns, thereby improving the accuracy of detecting potential non-compliance and the effectiveness of interventions. CRM contributes to systematic risk management through the processes of risk identification, evaluation, and handling, enabling the DJP to focus oversight on high-risk taxpayers and allocate resources optimally.

Meanwhile, BI's strengthening of decision-making through descriptive analytics and diagnostic analytics has proven to contribute significantly to presenting historical information and identifying causes of non-compliance. BI's ability to analyse and respond to changes in taxpayer behaviour supports the development of more targeted supervision, service, and law enforcement strategies. Thus, the synergy between big data, CRM, and BI not only drives operational efficiency at the DJP but also strengthens a fair, transparent, and sustainable tax system. These findings underscore the importance of data-driven digital transformation as the foundation for tax administration reform in Indonesia, while also providing an implementation model for other developing countries.

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