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Artificial Intelligence and International Business Law: Transforming Global Trade, Governance, and Compliance

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Abstract

Artificial Intelligence (AI) is increasingly reshaping international business law by transforming how firms manage regulatory compliance, governance processes, and cross-border trade operations. In practice, AI is applied to legal mechanisms such as automated customs compliance, regulatory monitoring, sanctions screening, and cross-border data transfer governance. Despite growing adoption, empirical evidence remains limited on how AI deployment and institutional conditions jointly influence compliance effectiveness and international trade performance. To address this gap, this study examines the effects of AI adoption, regulatory clarity, digital infrastructure readiness, and cross-border data governance quality on international trade performance, with compliance effectiveness as a mediating mechanism. Using Partial Least Squares Structural Equation Modeling (PLS-SEM) on 350 survey responses, the findings show that all four antecedent factors have a significant positive impact on compliance effectiveness. Compliance effectiveness, in turn, strongly enhances firm-level international trade performance, measured through improvements in trade efficiency, risk reduction, and market expansion. Moreover, compliance effectiveness significantly mediates the relationship between the institutional and technological factors and trade performance. Among the predictors, cross-border data governance quality exerts the strongest influence. These findings highlight that AI-enabled trade outcomes depend not only on technological adoption but also on regulatory clarity, robust digital infrastructure, and harmonized data governance frameworks, offering practical insights for policymakers and firms integrating AI into international business law.

KEYWORDS
artificial intelligence; international business law; compliance effectiveness; international trade performance; regulatory clarity; digital infrastructure readiness; cross-border data governance.

Introduction

Artificial intelligence (AI) is increasingly integrated into international business activities, particularly in areas related to regulatory compliance, governance, and cross-border trade operations. Firms engaged in international trade operate under complex and fragmented legal frameworks that require compliance with customs regulations, data protection laws, sanctions regimes, and reporting standards across multiple jurisdictions. As regulatory complexity increases and digital markets expand, organizations are turning to AI-enabled systems to support compliance monitoring, automate reporting processes, and manage legal risk more efficiently (Badghish & Soomro, 2024). With the spread of AI across enterprises, its legal landscape must evolve carefully to keep pace with rapid technological development (Agarwal & Nene, 2025). Regulatory compliance in global trade is becoming more complex due to expanding digital markets, varying jurisdictional regulations, and the

need for secure cross-border data exchange. AI supports compliance by automating repetitive activities, detecting risks, and ensuring adherence to evolving global legislation. However, challenges remain in applying AI to corporate law, particularly in regulatory clarity, digital infrastructure readiness, and cross-border data governance. AI systems assist compliance functions through natural language processing for regulatory monitoring, automated compliance checks, anomaly detection, and real-time identification of potential legal violations. These capabilities help organizations track regulatory updates, reduce human error, and respond quickly to emerging risks across jurisdictions. Clear and stable regulations are essential for effective AI deployment. When regulatory frameworks are ambiguous or frequently changing, organizations are less likely to rely on AI-driven compliance solutions due to legal uncertainty. This highlights the need for well-defined governance guidelines to support lawful and ethical AI use, enabling firms to mitigate compliance risks while gaining competitive advantage. In addition, effective AI-based compliance requires robust digital infrastructure to support automated controls, secure data processing, and cross-border coordination (Jones, 2023). Facilitating secure and integrated cross-border data flows while respecting privacy and intellectual property rights is equally critical. Strong data governance systems are necessary for AI tools to function effectively in international trade. Integrating AI into international corporate law presents both opportunities and challenges. It can significantly improve compliance and trade performance, but also requires careful attention to regulatory frameworks, infrastructure, and data governance. As AI adoption increases, policymakers must adapt existing laws to keep pace with technological change. AI's ability to enhance trade monitoring and regulation has important implications at the intersection of law and technology, with potential global trade impacts.

Existing research has examined AI adoption from technological, organizational, and environmental perspectives, while separate streams have explored regulatory compliance and international trade performance. However, these areas are often treated independently. Limited empirical evidence explains how AI adoption and legal–institutional conditions jointly influence international trade outcomes, particularly through internal compliance processes that translate regulatory requirements into practice. The introduction of AI into public international law creates both opportunities and challenges, raising complex legal questions that require timely attention from policymakers. Although AI can enhance compliance through automation and improved risk management, the absence of specific legal frameworks for its extensive use remains a major concern in international trade. The lack of global AI governance standards restricts organizations from fully leveraging AI for compliance in cross-border transactions. International trade law is already complex due to varying regulations across countries, and AI adds further complexity. Organizations must reconcile AI systems with diverse and sometimes conflicting legal requirements. Formal regulation of AI in international trade is necessary for safety and efficiency, yet difficult due to heterogeneous rules and standards. AI models relying on international data face challenges due to differences in privacy and data protection laws. These variations complicate compliance and hinder innovation, particularly where digital infrastructure is still developing.

AI can improve compliance through automation and monitoring, but its effectiveness depends on strong digital infrastructure. Without adequate technological capabilities, firms may struggle to adopt AI-based compliance solutions. Increasing demands for cross-border data governance further complicate implementation, emphasizing the need for international cooperation to ensure data privacy and security while enabling AI-driven compliance. Fragmented global data governance increases the risk of legal violations if data is not managed properly across borders. The absence of clear and unified policies for integrating AI into international commercial law creates uncertainty for firms. As AI adoption grows, the need for consistent regulation becomes more urgent, particularly in compliance management, data governance, and cross-border trade. Failure to address regulatory and infrastructure gaps may limit AI's role in driving innovation and business growth. Compliance effectiveness represents a critical but underexplored mechanism in this context. While prior studies recognize the influence of regulatory clarity, digital infrastructure readiness, and cross-border data governance on organizational behavior, less attention has been given to how these factors shape the effectiveness of AI-supported compliance systems. In complex cross-border environments, AI adoption alone may not improve trade performance unless supported by effective compliance structures that align organizational practices with regulatory expectations.

This research addresses the relationship between AI adoption, international business, and legal practice. As AI technologies become central to global operations, their role in governance, compliance, and international trade continues to expand. The study examines how AI implementation enhances compliance effectiveness, strengthens governance practices, and improves international trade performance. It provides insights for firms seeking to navigate complex regulatory environments using AI. The findings also offer guidance for policymakers and legal practitioners on integrating AI into legal systems to support trade and compliance.

AI technologies improve compliance effectiveness by automating tasks, identifying risks, and maintaining alignment with evolving regulations. As international trade becomes more digital, compliance challenges increase, particularly in monitoring cross-border data flows under different legal regimes. AI-based solutions offer scalable compliance strategies, reduce human error, and enhance overall compliance performance. Firms can use AI to automate legal processes and meet regulatory requirements more efficiently. However, successful AI integration depends on regulatory clarity and digital infrastructure. Clear legal frameworks define the boundaries within which AI systems operate, enabling organizations to fully utilize these technologies. In the absence of coherent regulations, AI may function ineffectively, creating legal risks for firms. The study highlights the importance of regulatory stability and the need for harmonized standards to support AI adoption in trade law. Policymakers must balance innovation with legal safeguards to ensure responsible AI deployment. Cross-border data governance remains a critical issue in AI-enabled trade. As organizations increasingly rely on data-driven solutions, secure and compliant data transfer becomes essential. Differences in data protection regulations affect AI adoption and create challenges in managing compliance across jurisdictions. This study contributes to understanding these challenges and

provides a basis for developing global data governance frameworks to support AI in international trade.

To address these issues, the present study examines the relationships among AI adoption, regulatory clarity, digital infrastructure readiness, and cross-border data governance quality, with compliance effectiveness as a mediating mechanism influencing international trade performance. Using survey data from individuals with academic or practical experience in international trade and compliance in the United States, the study applies Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the proposed relationships. By focusing on perceived organizational practices and compliance outcomes, this research offers an integrated perspective on how AI-enabled compliance operates at the intersection of technology adoption, legal–institutional conditions, and international trade performance.

This research is grounded in relevant theories that explain the influence of AI on international business law, particularly in terms of compliance and global trading. These theories complement each other and provide insights into the interaction between AI, corporate mechanisms, legal environments, and regulation. The TOE framework helps explain AI adoption in international business law by focusing on three elements: technology (AI tools), organization (readiness to adopt AI), and external environment (legislation, regulations, and trade policies). Examining these dimensions provides a clearer understanding of how AI is implemented in firm activities and its role in improving compliance and governance. Diffusion of Innovation (DOI) theory explains how new technologies such as AI spread across organizations and industries. It suggests that adoption increases when innovations offer clear benefits, align with existing practices, and are easy to implement. Firms are more likely to adopt AI when it enhances compliance, reduces costs, and improves decision-making, especially as industry norms and regulatory acceptance develop. Compliance management theory is central to understanding AI integration in international corporate law. It highlights organizational efforts to meet regulatory requirements, supported by AI technologies that enable monitoring of compliance, risk, and regulatory changes. This improves efficiency and reduces human error in legal processes. The effective use of AI in international commerce also depends on regulatory clarity and governance. Legal certainty encourages firms to adopt AI, while unclear regulations create hesitation due to potential legal risks. Additionally, data governance is critical, as AI relies on secure and compliant data use across jurisdictions. Data governance theories emphasize frameworks that enable AI use while ensuring privacy and adherence to international laws.

AI adoption (AIA) and compliance effectiveness (CE)

AI and its Effectiveness in Auditing The use of AI has been found to have a positive effect on the effectiveness of the audit, but this effect can differ according to timing and context (Zhao, 2025). How AI and ML improve cybersecurity compliance Challenge: Automating the identification of threats One of the main advantages that arise from using machine learning or

finance systems shows that the digitization of compliance-related processes, including e-invoicing and electronic reporting, is associated with improved compliance outcomes through greater process efficiency, enhanced transparency, and increased technology acceptance among regulated entities (Roida et al., 2025). The use of digital tax system has also any other form of artificial intelligence within a security product is how it enables you to automatically detect if any threats are present. These ML-powered models increase efficiency and reduce human errors, thereby strengthening compliance systems in high-risk industries such as finance and healthcare. What do machine learning and automatic tax software have in common? They are two solutions changing the world of financial reporting by making things more accurate, on time and efficient. This leads to the increased business tax compliance and also reduce the reporting errors (Shah, 2025). The automation AI for banking maturity parallels the strength of compliance operations. AI streamlines regulators' operations, reduces operational risks, and improves fraud detection systems to reinforce compliance regimes (Singh et al., 2025). Implementation of AI increases the effectiveness of compliance but critical challenges about algorithmic transparency, ethical governance and legal issues are still remain. These problems highlight the reason for strong AI governance frameworks in order to guide ethical use and regulation of AI (Huang & Niyomsilp, 2025).

H1: AI adoption positively influences compliance effectiveness.

Regulatory clarity (RC) and compliance effectiveness (CE)

Explicit rules increase taxpayers' understanding. Tax knowledge has a positive effect on tax compliance among self-employed taxpayers in Indonesia (Fuadi et al., 2024). As a part of the literature review on compliance, psychological ability and social opportunity are identified as important factors in promoting compliance. It is clear that good legislation can aid these areas. Studies conducted during the COVID-19 pandemic suggest that the clarity of laws significantly impacts the level of compliance. Improved readability has been linked to better outcomes when controlling transmission of the virus (Alfano & Guarino, 2024). Transparency in policy is paramount. It does influence the willingness of people to comply with regulation indirectly by increasing their understanding of what laws mean, as has shown across various areas of policy (Porumbescu et al., 2017). We need to realize that also compliance behavior is influenced by interests and not only subjected the will of an individual. To simply make things clear will not necessarily lead to greater compliance with expectations, however, if other factors that contribute to the effect are not considered (Parker & Nielsen, 2017).

H2: Regulatory clarity positively influences compliance effectiveness.

Digital infrastructure readiness (DIR) and compliance effectiveness (CE)

Digital infrastructure readiness plays a critical role in enhancing compliance effectiveness by improving efficiency, transparency, and coordination across regulatory systems. Well-developed digital infrastructure enables organizations to integrate advanced technologies such as electronic invoicing systems, real-time reporting platforms, and automated record-keeping tools, which simplify compliance processes and reduce administrative burdens. Empirical evidence from tax administration and public

increased voluntary compliance in a number of jurisdictions and administrative compliance costs are lower (Zulaikhah, 2025), although challenges regarding low digital literacy and data security in this area persist. Digital infrastructure in transport finance means real-time monitoring and predictive analysis, enabling compliance across jurisdictions. Cloud Native architectures and

exception monitoring drive operational efficiency and compliance (Nallapu, 2025). Countries that have the matured digital governance and well-established framework for IT audit tend to have higher tax revenues with lower level of corruption. E-maturity and electronic governance are also most important factors for tax performance and fiscal integrity (Umbet et al., 2025). A strong digital backbone, which includes broadband and cybersecurity as well as regulation systems, is necessary for compliance preparedness. Companies that integrate with new technologies and compliance sureties are more resilient to technology disruptions (Gupta & Saranya, 2025). Previous studies in prominent information systems journals indicate that sophisticated digital infrastructure and platform capabilities are crucial for organisations to effectively implement AI technologies within intricate regulatory frameworks, as infrastructure maturity facilitates scalability, interoperability, and compliance across institutional boundaries (Rai et al., 2019). Even as the state of preparedness of digital infrastructure contributes significantly to the effectiveness of compliance, there remain issues like digital literacy, security of data and a call for robust regulatory models. Effectively tackling these concerns with inclusive policies and ongoing infrastructure growth is a key to rein in on the benefits of digital transformation in compliance.

H3: Digital infrastructure readiness positively influences compliance effectiveness.

Cross-border data governance quality (CDGQ) and compliance effectiveness (CE)

Cross-border data governance critically shapes how organizations comply with international laws. Effective governance structures safeguard data, uphold sovereignty, and align with international norms through clear policy direction, standardization, and stakeholder engagement. These elements are essential for achieving high levels of compliance. Well-designed governance models address challenges such as regulatory fragmentation and technological incompatibility, while aligned policies facilitate smoother compliance across jurisdictions. Global treaties and coordinated regulatory frameworks further reduce compliance uncertainty and cross-border legal risks. Prior research shows that harmonized data governance arrangements across jurisdictions lead to higher regulatory adherence and lower compliance complexity, particularly in data-intensive and cross-border contexts (Uddoh et al., 2021). Rather than implying uniform compliance, these findings highlight how shared governance structures and technical standards enhance legal alignment and interoperability. Such models promote consistency in legal requirements while enabling secure and lawful cross-border data flows. By improving data quality, regulatory coordination, and institutional alignment, effective cross-border data governance reduces ambiguity and strengthens organizations' ability to meet legal obligations across multiple jurisdictions. Focusing on data quality and governance as core objectives enhances both data security and availability in a compliant manner (Tripathi et al., 2024). Efficient governance mechanisms support regulatory adherence and facilitate digital transformation efforts. However, gaps in legal standards and unclear compliance requirements can result in inconsistent enforcement and increased compliance costs (He, 2025). Coordinated governance involving regulators, enterprises, and technology can reduce costs and improve innovation efficiency (Xue, 2025). Despite its benefits, cross-border data governance faces challenges such as geopolitical tensions and technological differences. Addressing these issues may require advanced solutions, including blockchain-based compliance systems and AI-driven regulatory supervision.

H4: Cross-border data governance quality positively influences compliance effectiveness.

Compliance effectiveness (CE) and international trade performance (ITP)

Effective compliance is a prerequisite for the expansion of international trade. It ensures that businesses operate within legal frameworks, making cross-border transactions smoother and faster. Strong compliance reduces trade costs, increases revenue, and enhances firm competitiveness, all of which are essential for improving trade performance.

Compliance with domestic and international trade laws sustains the legality and stability of cross-border transactions. This includes adherence to import and export regulations, customs duties, and procedural requirements, which helps reduce risks in foreign trade (Shakhnazarov, 2024). Firms can further enhance trade performance by implementing effective compliance processes supported by automated technologies, enabling them to respond to sanctions and regulatory restrictions more efficiently.

Reducing border compliance costs can significantly improve trade efficiency. A 1% reduction in such costs could generate savings of up to $43 billion, highlighting the importance of efficient compliance procedures for cost reduction and competitiveness. The development of IT infrastructure-based invoicing systems also strengthens compliance, making border operations more efficient and lowering operational costs for both public authorities and businesses (Arsyida et al., 2017).

Effective compliance is also critical for tax systems, particularly value-added tax (VAT). Proper border controls improve VAT compliance, which is closely linked to import activities and government revenue, emphasizing the role of compliance policies in trade performance (Morrow et al., 2022).

Adherence to international standards helps firms overcome technological trade barriers and supports market access, especially for small and medium-sized enterprises (SMEs). SMEs that participate in standard development are more likely to expand exports (Liao & Parkouda, 2023). However, SMEs often face greater compliance challenges, making targeted support and export promotion programs essential to enhance their competitiveness and trade performance.

H5: Compliance effectiveness positively influences international trade performance.

Mediating role of Compliance effectiveness (CE)

Companies can navigate global markets more efficiently using AI-based compliance tools. These tools reduce barriers and help firms address legal challenges and regulatory obligations across sectors. Compliance plays a central role in international trade by ensuring that organizations follow international laws, making effective policy frameworks essential. Firms are more willing to adopt AI systems when regulations are clear, as this provides assurance that their operations remain legally compliant. This regulatory clarity strengthens Compliance Effectiveness and supports cross-border trade by improving operational efficiency.

AI-based compliance systems perform best in environments with well-defined regulations, enabling organizations to manage risks and comply with diverse legal requirements (Mirzaye & Mohiuddin, 2025). When firms have a clearer understanding of legal expectations,

Compliance Effectiveness acts as a mediating factor linking regulatory clarity to improved business outcomes. AI tools allow organizations to automate compliance checks, mitigate risks, and adapt processes in real time, thereby enhancing compliance management. Compliance Effectiveness helps firms meet international trade laws, reducing delays, legal risks, and administrative burdens in cross-border operations. AI-driven compliance technologies also enable firms to manage legal obligations more effectively, contributing to improved trade performance.

Fundamentally, Compliance Effectiveness reflects how the use of AI translates into business success. By leveraging AI compliance solutions, organizations can operate more efficiently in global markets while ensuring regulatory adherence. Clear regulations encourage firms to invest in AI by reducing legal uncertainty and ensuring system reliability (Mirishli, 2025). This transparency enhances Compliance Effectiveness and facilitates cross-border transactions.

The relationship between data governance and trade performance further highlights the importance of Compliance Effectiveness. Strong data governance ensures that AI systems monitor and manage data flows in compliance with international data protection laws. This reduces legal risks and supports stable cross-border operations. AI-based compliance tools also allow firms to adapt to evolving legal requirements without constant manual oversight, improving efficiency and trade outcomes. Effective control of cross-border data flows is essential for successful international trade. Organizations with robust data governance frameworks are better positioned to comply with global regulations, reducing legal uncertainty and operational risks.

Overall, Compliance Effectiveness is a key mechanism that enables organizations to leverage AI for regulatory compliance and improved international trade performance. It ensures that firms can meet legal requirements efficiently while enhancing operational effectiveness in global markets.

H6a: Compliance effectiveness mediates the relationship between AI adoption and international trade performance.

H6b: Compliance effectiveness mediates the relationship between regulatory clarity and international trade performance.

H6c: Compliance effectiveness mediates the relationship between digital infrastructure readiness and international trade performance.

H6d: Compliance effectiveness mediates the relationship between cross-border data governance and international trade performance.

Conceptual Framework:

This Study's foundation is built on the connections found in existing literature. Factors like AI adoption, regulatory clarity, digital infrastructure readiness, cross-border data governance, and compliance effectiveness all shape international trade performance, particularly when it comes to business trade. (see figure 1).

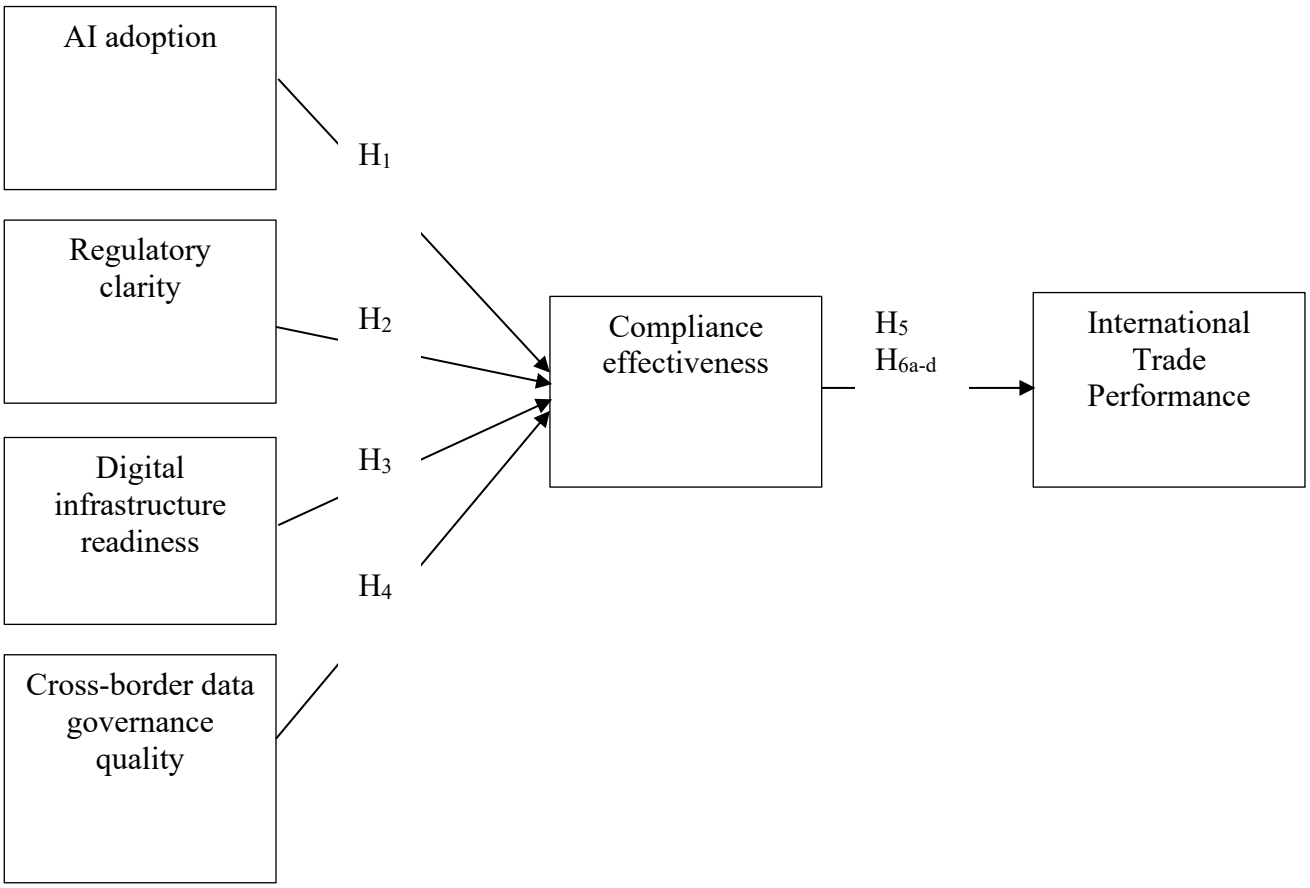

Figure 1. Conceptual Framework

Methods

Table 1. Scale and item sources

Constructs	Item code	Number of items	Scale (Likert)	Source
AI adoption	AIA	4	5 Points	(Badghish & Soomro, 2024)
Regulatory clarity	RC	4	5 Points	(Agarwal & Nene, 2025; Mirishli, 2025)
Digital infrastructure readiness	DIR	4	5 Points	(Mirzaye & Mohiuddin, 2025)
Cross-border data governance quality	CDGQ	4	5 Points	(Chin & Zhao, 2022)
Compliance effectiveness	CE	4	5 Points	(Gammisch & Balina, 2014)
International Trade Performance	ITP	4	5 Points	(Jones, 2023)

Table 2.Demographic Profile

Particulars		Frequency	Percentage
Gender	Male	188	53.7%
	Female	162	46.3%
Age (Years)	21-30	210	60.0%
	30-40	5	1.4%
	above 40	4	1.1%
	Below 20	131	37.4%
Profession	Business	84	24%
	Homemaker	28	8%
	Service	35	10%
	Student	200	58%
Income	2500-3500	11	3.1%
	3500$--4500$	17	4.9%
	above 4500$	15	4.3%
	Below 2500$	307	87.7%

Research Design

This study is a closer examination of how one certain aspect of AI, AI adoption, transparency and accountability can affect international trade performance and consequently international business law in comparison to other factors including clear regulation, digital infrastructure readiness, cross border data governance and compliance efficiency. It provides a strong “skeletal structure” for understanding the complex interplay between these aspects in the United States. We used Partial Least Squares Structural Equation Modelling (PLS-SEM) to test our hypotheses and model measurement as well as structural models. We decided to go this route as it is especially well-suited for models that are relatively large and complex, consisting of multiple constructs, latent variables, and even interaction terms, even when the data does not meet a normal distribution.

Measurement Instruments

The survey tool was made using scales from previous research, but the wording was changed to fit the international business law and trade performance in USA. On a five-point Likert scale, 1 meant "Strongly Disagree" and 5 meant "Strongly Agree”. (See Table 1).

Three technology adoption specialists meticulously reviewed the questionnaire to verify its accuracy. Subsequently, we evaluated it with 30 respondents to ascertain its clarity and reliability. Before full implementation, we made some minor adjustments to the phrasing.

Population and sampling

The study adopts an individual-level survey approach to capture informed perceptions of organizational AI adoption, compliance effectiveness, and international trade performance. Rather than surveying firms directly, the unit of analysis consists of individual respondents with academic or practical exposure to international trade, digital

compliance systems, or AI-related business processes. This approach is consistent with prior research that relies on knowledgeable informants to assess organizational practices using perceptual measures. A non-probability purposive sampling technique was employed to ensure that respondents possessed sufficient familiarity with international business, trade regulations, or digital systems relevant to the study context. Eligible participants included students enrolled in business, law, information systems, or international trade programs, as well as early-career professionals and individuals involved in administrative or support roles connected to international business environments. Although a substantial proportion of respondents were students, their inclusion is justified by their formal training, coursework, internships, and exposure to trade-related systems and regulatory frameworks. Participants were recruited through university networks, professional contacts, and online survey distribution platforms targeting individuals based in the United States. Participation was voluntary, and all respondents were informed of the study's purpose. Anonymity and confidentiality were assured, and no personally identifiable information was collected. It is acknowledged that the data reflect self-reported and perceptual assessments rather than objective firm-level metrics. However, this approach aligns with the exploratory and theory-testing objectives of the study and is appropriate for examining perceived compliance effectiveness and trade performance within a PLS-SEM framework. This approach made our participants ideal for evaluating usability and experience-related factors. Kline, (2023) noted that a study should ideally include over 200 respondents, so we aimed for at least 400, which is sufficient for Structural Equation Modeling (SEM) as per Hair et al. (2014). Between November and December 2025, we distributed a total of 400 questionnaires, both online and in person. After filtering out incomplete and inconsistent responses, we ended up with 350 valid ones for our analysis.

Data collection

We have a single instance of the unlikely confluence of big data, internet of things and artificial intelligence resulting in "hyperconnected industries." This article examines how emerging digital technologies, including artificial intelligence, are experienced and perceived in the context of international trade and compliance management. The study focuses on individual respondents with academic or practical exposure to international business, trade, or compliance-related activities, rather than on organizational representatives as expert informants. When distributing the questionnaire, participation was voluntary, and all respondents were informed about the purpose of the study and provided their consent. Confidentiality and anonymity were assured, and no personally identifiable information was collected. This approach ensured ethical data collection while capturing informed perceptions of AI adoption and compliance effectiveness in international trade contexts. Table 2 presents the demographic background of respondents.

The demographic details of the survey participants reveal that a majority are male (53.7%) and fall within the 21-30 age range (60.0%). The largest group consists of students (58%), and many of the respondents have a low income, with 87.7% earning less than 2500$. A smaller fraction of them works in the service (10%) and business (24%) sectors.

Measurement model, analytical tools and technique

We examined the measurement model using PLS-SEM. We took reflective-formative measurement in this matter. The processed data were analyzed using SmartPLS 4.1.1.6, which is a PLS-SEM software for advanced researchers. A useful tool for examining and predicting complex associations in small-to-medium sample sizes. We followed the two-step (planned) manner, in which we work on measurement and then from there to the structural model. We also examined indicator reliability, internal consistency reliability and convergent and discriminant validity of the measurement model. Standard procedures were followed to ensure clarity, consistency, and accuracy in data analysis and reporting.

Result and Discussion

Table 3.Common method biased (CMB) test

Variables	AIA	CDGQ	CE	DIR	ITP	RC
AIA			1.007			
CDGQ			1.874			
CE					1.000	
DIR			1.292			
ITP						
RC			1.745			

Source: SmartPLS output (version 4.1.1.6).

Table 4.Construct's validity and reliability test

Variables	Item Code	Convergent validity		Internal consistency		Multicollinearity Statistics
		Loading > 0.70	Cronbach's alpha > 0.70	Composite reliability > 0.70	AVE > 0.50	VIF < 3 or 5
AI Adoption	**AIA1**	0.914	0.915	0.939	0.794	2.973

Variables	Item Code	Convergent validity		Internal consistency		Multicollinearity Statistics
		Loading > 0.70	Cronbach's alpha > 0.70	Composite reliability > 0.70	AVE > 0.50	VIF < 3 or 5
	AIA2	0.883				3.035
	AIA3	0.906				2.827
	AIA4	0.860				2.721
Cross-border Data Governance Quality	CDGQ1	0.887	0.877	0.915	0.729	2.749
	CDGQ2	0.868				2.521
	CDGQ3	0.856				2.571
	CDGQ4	0.802				2.140
Compliance Effectiveness	CE1	0.886	0.904	0.933	0.777	2.705
	CE2	0.887				2.694
	CE3	0.877				2.654
	CE4	0.876				2.568
Digital Infrastructure Readiness	DIR1	0.900	0.875	0.912	0.722	2.970
	DIR2	0.904				2.955
	DIR3	0.779				2.091
	DIR4	0.807				2.019
International Trade Performance	ITP1	0.900	0.899	0.929	0.766	2.990
	ITP2	0.900				3.114
	ITP3	0.868				2.549
	ITP4	0.832				2.259
Regulatory Clarity	RC1	0.924	0.920	0.943	0.807	3.981
	RC2	0.913				3.723
	RC3	0.873				2.703
	RC4	0.882				2.796

Source: SmartPLS output (version 4.1.1.6).

Table 5.Discriminant validity test

HTMT	Variables	AIA	CDGQ	CE	DIR	ITP	RC
	AIA						
	CDGQ	0.086					
	CE	0.148	0.630				
	DIR	0.031	0.514	0.394			
	ITP	0.066	0.776	0.646	0.495		
	RC	0.051	0.711	0.568	0.418	0.677	
Fornell-Larcker Criterion	Variables	AIA	CDGQ	CE	DIR	ITP	RC
	AIA	0.891					
	CDGQ	0.080	0.854				
	CE	0.140	0.567	0.882			
	DIR	0.028	0.457	0.372	0.849		
	ITP	0.066	0.693	0.590	0.451	0.875	
	RC	0.042	0.644	0.521	0.393	0.623	0.898

Source: SmartPLS output (version 4.1.1.6)

Table 6.Model fitness test

Fitness Indices	Saturated model	Estimated model
SRMR	0.048	0.104
d_ULS	0.696	3.242
d_G	0.377	0.478
Chi-square	841.682	980.309
NFI	0.869	0.848

Source: SmartPLS output (version 4.1.1.6)

Table 7.Hypothesis test

	Path Direction	Estimates (β)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Decision
H_1	AIA → CE	0.099	0.044	2.235	0.025	Accepted
H_2	RC → CE	0.249	0.065	3.849	0.000	Accepted
H_3	DIR → CE	0.113	0.056	1.999	0.046	Accepted
H_4	CDGQ → CE	0.348	0.068	5.107	0.000	Accepted
H_5	CE → ITP	0.590	0.043	13.873	0.000	Accepted
H_{6a}	AIA → CE → ITP	0.058	0.025	2.286	0.022	Accepted
H_{6b}	RC → CE → ITP	0.147	0.041	3.601	0.000	Accepted
H_{6c}	DIR → CE → ITP	0.066	0.033	1.991	0.047	Accepted
H_{6d}	CDGQ → CE → ITP	0.205	0.047	4.333	0.000	Accepted

Source: SmartPLS output (version 4.1.1.6); Note: a = P < 0.05; b = P < 0.001

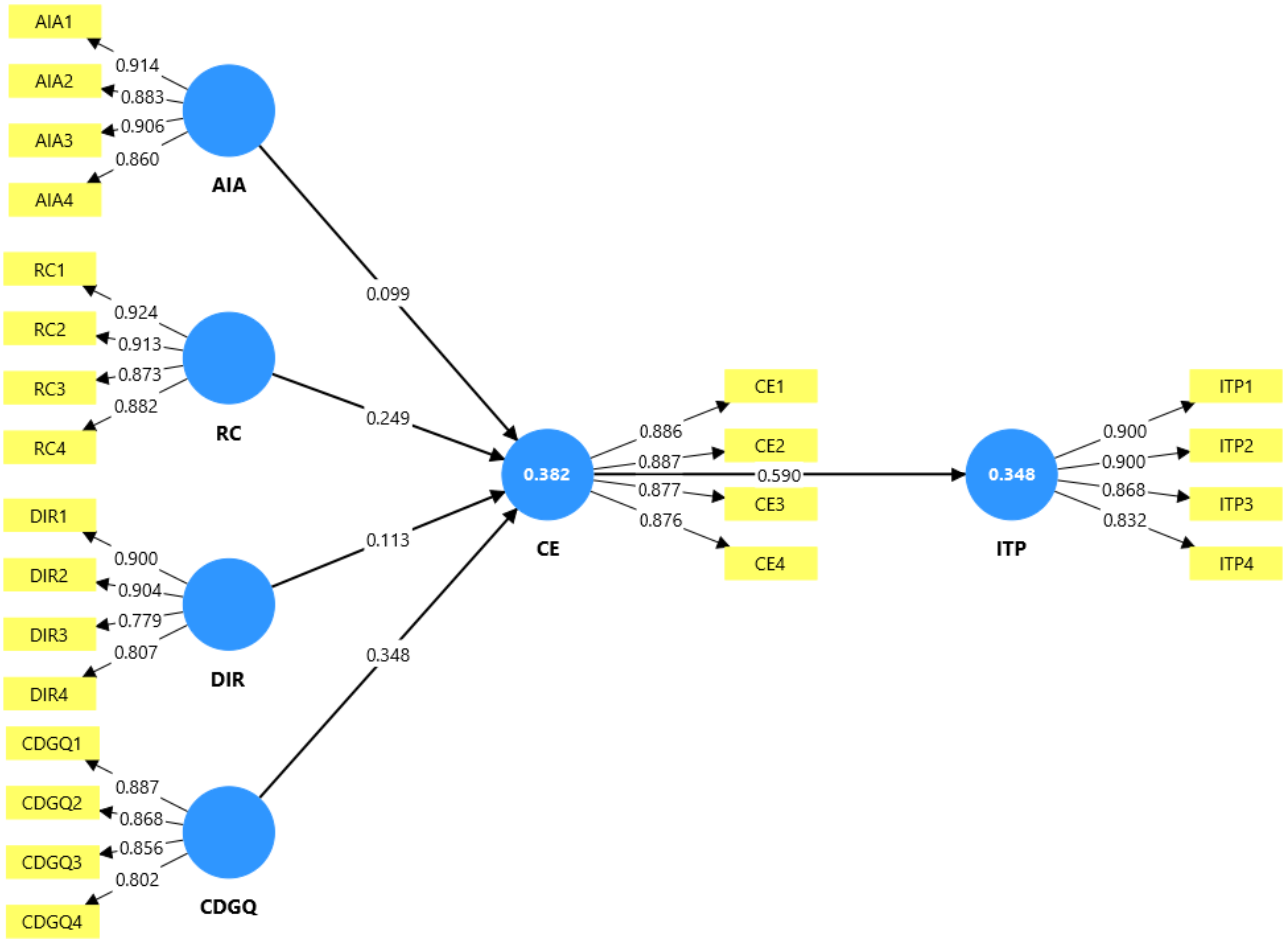

Figure 2.Model resolution by PLS algorithm (version 4.1.1.6)

Analysis and Interpretation.

The second-order CFA test for examining the Common Method Bias (CMB) looks into whether there is any unnatural inflation in the relationships among the research variables, merely because they have been obtained from same source. This is important to establish the validity of the quantitative results (Podsakoff et al., 2003). The results from the table show that all VIF values are way below the widely accepted cut-off of 3.3 (which means common method bias is not an issue in this data set) (Kock, 2015). Especially, the VIF values of CE to AIA (1.007), CDGQ to CE (1.874), DIR to CE (1.292) and RC to CE (1.745) as well as ITP to CE (1.000) imply that no variables are in probability for its collinearity problem. These values indicate that each of the constructs serves a different purpose in the model and that common method variance is not a potential source of bias in the relationships. The test rules whether the data is too similar because in all cases everything was measured

in the same way. All the numbers fell within the safe range in table 3, which indicates our data are clean and free from common source bias. This gives us greater faith that the relationships among the variables found in the study really reflect patterns of association rather than measurement errors.

This table 4 presents the construct validity and reliability analysis that allows us to confirm whether or not our measures actually measure their underlying attribute and whether or not scales are reliable enough for further investigation. Results The results indicate high convergent validity for all constructs, with all factor loadings exceeding the minimal criterion value of 0.70 as generally recommended (Costello & Osborne, 2005). This suggests that the indicators measure the latent construct well. and internal consistency is also satisfactory (Cronbach's alpha between 0.875 and 0.920, composite reliability from 0.912 to 0.943) with all measures above the usually recommended threshold of.70 in structural equation modelling. Then, the AVEs for all constructs (varied from 0.722 to 0.807) are higher than the threshold of 0.50, indicating that each construct accounts for more than half of the variance of its indicators (Fornell & Larcker, 1981). The VIF values remain under the threshold of 5, indicating that multicollinearity is not a problem and that there's no redundancy between each among the independent variables. In summary, the measurement model exhibits good psychometric qualities which further support the reliability and validity of the constructs in our study. The table tells us that all the survey questions performed well and measured pretty much what they were supposed to. The answers were consistent, there was a close association between the items and their dimensions, while no intersection existed among the factors. That means the data is good and now ready for deeper analysis.

Finally, this table 5 shows discriminant validity test so that we are able to check whether the constructs included in a model are truly different from each other. It verifies that each of the variables measures a distinct concept, not confounded with one other. The results of both the HTMT ratios and Fornell–Larcker Criterion, support that we have indeed achieved discriminant validity. All HTMT values fall comfortably below the recommended cut-off value of 0.85, with a maximum of 0.776, showing that no pair of constructs is overly similar (Henseler et al., 2015). Likewise, based on Fornell–Larcker criterion of discriminant validity, the square root of AVE for all construction should be greater than others construct like AIA (0.891), CDGQ (0.854), CE (0.882), DIR (0.849), ITP (0.875) and RC construct (0.898). This further shows that, the model has a good strength and clarity in terms of explaining more variance among its indicators than other constructs do. In other words, the table illustrates that all of those variables in our study are unique. There's no overlap or shared measurement, and the numbers are comfortably in the safe range. This reflects the well-organized nature of our model, with every concept making its unique contribution to make the analysis robust.

Table 6 presents the global model fit indices for both the saturated and estimated models. The SRMR value for the saturated model (0.048) indicates a good fit, whereas the SRMR value for the estimated model (0.104) slightly exceeds the conventional threshold of 0.10, suggesting a marginal but acceptable model fit in the context of PLS-SEM. Prior research notes that SRMR should be interpreted cautiously in variance-based structural equation modeling, particularly for complex and prediction-oriented models (Hair, 2014; Hu & Bentler, 1999). Also, considering the values of d_ULS and d_G are good, meaning the discrepancies between the realized and model-implied covariance lack significance. The chi-square values are both a bit high (841.682 and 980.309) but not uncommon with complex models and large sample sizes, so it does not significantly detract from the credibility of the model. The NFI values of 0.869 for the saturated model and 0.848 for the estimated model are close to a desired cutoff of.90 indicating that the model is an adequate fit. What the table tell us is that we can use the model with high confidence that it's good for this data. The fit statistics are reasonable, indicating that the model fits to the data in reality. Though some, including chi-square, may seem large values, they are typical in this kind of analysis and so we will trust the overall model.

This table 7 presents the results of hypothesis testing, which allows us to understand whether we are able to statistically substantiate the relationships we hypothesized between the variables in the structural model. Each of the hypotheses in the model was supported, as each path demonstrates a statistically significant effect with p-values less than 0.05. The findings indicate that AI Adoption, Regulatory Clarity, Digital Infrastructure Readiness and Cross-border Data Governance Quality have positive effects on Compliance Effectiveness, while the effect of CDGQ is the most-pronounced ($\beta = 0.348$, $p = 0.000$). The level of Compliance Effectiveness is also very strong and significantly affects International Trade Performance ($\beta = 0.590$, $p < 0.000$), thus indicating its crucial position in our model. The mediated routes are also supported, as well as the fact that Compliance Effectiveness mediates the associations between all four predictors on International Trade Performance. For instance, the indirect effect from Regulatory Clarity to International Trade Performance is prominent ($\beta = 0.147$, $p = 0.000$), and CDGQ to International Trade Performance ($\beta = 0.205$, $p = 0.000$) follows not much away either. These results endorse the theoretical propositions and establish that predictors significantly function as a direct as well as an indirect means to interact with International Trade Performance via Compliance Effectiveness.

The table means there isn't a relationship proposed in the model that is not significant. All of the things we were looking at actually do matter with regard to compliance and trade performance, and none of the hypotheses got rejected. This means that the model is adequately explaining how AI, regulations, digital readiness and data governance deliver better compliance leading to an

improvement of international trade outcomes. (See Figure 2).

The findings provide empirical evidence that AI adoption and legal–institutional conditions influence international trade performance through the mediating role of compliance effectiveness. Specifically, AI adoption, regulatory clarity, digital infrastructure readiness, and cross-border data governance quality each have a positive and significant effect on compliance effectiveness, which in turn strongly improves international trade performance. These results establish compliance effectiveness as a central mechanism linking technological and institutional factors to trade outcomes. From a Technology–Organization–Environment (TOE) perspective, the findings indicate that AI adoption enhances organizational compliance processes when supported by favorable environmental conditions. Regulatory clarity reduces uncertainty and allows firms to deploy AI systems within defined legal boundaries, while digital infrastructure readiness enables the integration of AI-enabled compliance tools through reliable platforms, interoperability, and secure data processing. The mediating role of compliance effectiveness shows that AI adoption alone does not improve trade performance unless it is embedded within compliance structures aligned with regulatory requirements. This refines technology adoption research by positioning compliance effectiveness as the capability through which AI-driven efficiencies are realized in complex cross-border contexts. Consistent with diffusion of innovation theory, regulatory certainty and governance quality increase the perceived compatibility and usefulness of AI-enabled compliance systems. Clear regulations strengthen organizational confidence in adopting AI, particularly in environments characterized by multiple legal regimes. Prior studies indicate that unclear regulations can hinder effective AI use, especially in cross-border data transfers. The findings also highlight the importance of digital infrastructure readiness. Organizations with advanced infrastructure are better equipped to deploy AI solutions such as automated reporting, e-filing, and real-time monitoring, improving compliance efficiency and reducing administrative burdens. In contrast, limited infrastructure restricts adoption and increases complexity. Cross-border data governance quality emerges as a key determinant of compliance effectiveness and trade performance. Strong governance frameworks ensure secure data flows, compliance with privacy and intellectual property laws, and reduced legal risks. The lack of harmonized data governance increases uncertainty and complicates international trade, emphasizing the need for regulatory coordination. Although the model shows marginal global fit, it is acceptable for PLS-SEM focused on prediction and theory development. However, results should be interpreted considering the reliance on perceptual data and cross-sectional design.

Conclusion

This study examined the role of compliance effectiveness in shaping the relationship between AI adoption, legal–institutional conditions, and international trade performance. By integrating perspectives from technology adoption, compliance management, and international business law, the findings provide evidence that compliance effectiveness serves as a central mediating mechanism through which AI-enabled systems contribute to improved trade-related outcomes. The results indicate that AI adoption, when supported by regulatory clarity, robust digital infrastructure, and effective cross-border data governance, enhances organizations' ability to manage compliance processes. These improvements are associated with higher levels of perceived international trade performance, underscoring the importance of aligning technological innovation with legal and institutional readiness rather than relying on technology adoption alone. The study contributes to theory by extending the Technology–Organization–Environment framework into the domain of international business law and compliance. It advances existing research by positioning compliance effectiveness as an enabling capability that translates technological and institutional conditions into trade performance benefits. This perspective highlights that AI-enabled compliance is not merely an operational tool but a structurally important mechanism that reduces legal risk, supports cross-border operations, and enhances organizational efficiency in complex regulatory environments. From a practical and policy perspective, the findings suggest that organizations should view AI-driven compliance as a strategic function rather than a regulatory burden. Clear and consistent regulatory frameworks, investments in digital infrastructure, and coordinated cross-border data governance are essential to support the effective deployment of AI in international trade. Policymakers play a critical role in fostering regulatory clarity and harmonized data governance standards that enable innovation while ensuring lawful and ethical AI use. Several limitations should be acknowledged. The study relies on self-reported, perceptual data collected from individual respondents and is geographically limited to the United States, which may affect generalizability.

Theoretical contribution

This study makes several theoretical contributions to the literature on technology adoption, international business law, and compliance management. First, it extends the Technology–Organization–Environment (TOE) framework into international business law by explicitly incorporating legal and institutional factors, namely regulatory clarity and cross-border data governance quality, as core environmental conditions shaping technology-enabled compliance outcomes. While prior TOE studies have focused mainly on operational or performance outcomes, this research demonstrates that

compliance effectiveness is a critical intermediate mechanism through which technological and environmental factors influence international trade performance.

Second, the study refines the TOE framework by positioning compliance effectiveness not simply as an organizational outcome but as a mediating capability that translates AI adoption and institutional readiness into measurable trade performance benefits. This refinement highlights that in legally complex and cross-border environments, technology adoption alone is insufficient unless supported by effective compliance processes aligned with regulatory requirements. By integrating international trade law considerations such as regulatory certainty and cross-border data governance, the study strengthens TOE's applicability in complex legal and economic contexts (Agrebi & Jallais, 2015).

Third, by incorporating insights from Diffusion of Innovation (DOI) theory, the study advances understanding of how AI adoption evolves in international business law settings (Rogers, 2003). The findings indicate that AI diffusion in global trade is influenced not only by perceived benefits but also by regulatory clarity, digital infrastructure readiness, and the ability to manage cross-border data effectively. This extends DOI theory by integrating legal and infrastructure dimensions into innovation adoption processes in global business environments.

The study also contributes to compliance management theory by demonstrating how AI enhances compliance effectiveness. Unlike traditional perspectives that focus on organizational mechanisms for meeting legal requirements, this research shows that AI-driven compliance systems improve monitoring, reduce human error, and strengthen responsiveness to evolving regulations. These capabilities are particularly valuable in international trade, where firms must continuously adapt to changing legal frameworks.

The study advances understanding of cross-border data governance in international economic law. It emphasizes the importance of harmonized global data governance systems to enable secure, privacy-compliant AI deployment. By highlighting the constraints created by fragmented data protection regulations, the research provides a foundation for future studies on how firms can manage these challenges while leveraging AI to improve compliance effectiveness and international trade performance.

The theoretical contributions of this study provide strong reflections on the convergence of AI, international business laws and compliance management. Our work enhances the understanding of how adoption of AI affects compliance effectiveness and international trade performance drawing on well-established theories, like TOE framework (Goodhue & Thompson, 1995) and DOI theory (Rogers et al., 2019). This also opens the door to novel theoretical framings of how AI functions in commercial law, regulatory transparency, digital infrastructures and transnational data governance. This provides a basis for future research in this live area.

Managerial implication

This study offers important lessons for business leaders, policymakers, and legal professionals navigating compliance and AI integration in international trade. As organizations increasingly rely on AI to improve efficiency and meet global regulatory requirements, several factors determine successful implementation.

Managers must first address regulatory complexity. Clear guidelines on AI systems are essential to ensure compliance with both national and international laws. Organizations operating across borders face varying legal requirements, making it necessary for managers to understand and communicate these rules effectively. Building a strong compliance culture and training employees in the lawful use of AI can improve system interpretability and reduce the risk of violations.

The findings also highlight the need for strong digital infrastructure. Managers should invest in systems that support AI integration, including IT infrastructure, cloud platforms, and advanced data management capabilities. Organizations with limited digital readiness must prioritize upgrading their technological base to enable AI-driven compliance. At the same time, managers should anticipate technological change and ensure that infrastructure remains adaptable for future developments.

Cross-border data governance is another critical concern. Since AI systems depend on large volumes of data, organizations must ensure secure and lawful data flows across jurisdictions. Managers should establish robust data governance frameworks that emphasize privacy protection and compliance with global regulations. This may involve collaboration between legal and technology teams to address jurisdictional differences and implement secure data transfer mechanisms.

The study further emphasizes the value of compliance-oriented AI solutions. AI-enabled compliance systems can streamline regulatory processes, reduce administrative errors, and enhance responsiveness to changing legal requirements. By automating monitoring and control activities, firms can lower transaction costs and mitigate legal and operational risks while maintaining compliance with international trade regulations.

From a managerial perspective, AI integration should be viewed not only as a regulatory requirement but as a strategic capability. Organizations that effectively embed AI-driven compliance mechanisms are better positioned to manage regulatory complexity, sustain cross-border operations, and improve international trade performance. Managers who focus on these enabling factors can successfully integrate AI into global business operations.

Academic contribution

The scholarly contribution of this research is adequately founded on the in-depth analysis of compliance efficacy and international trade performance with the relationship between Artificial Intelligence and International Business law. In the first instance, one could

argue that this research makes a noteworthy contribution to the literature by explaining unprecedented boost phenomenon and proposing the technology usage can be associated with compliance model. In so doing a new constellation of determinants was emphasised, while other evidence for what may be difficulties faced by firms in an ultra-globalized legal order came to light. The work also adds to broader debates about the future of corporate law and regulation by describing more fully the influence of regulation, digital infrastructure, and data governance on AI utility. Particularly, the author stresses AI's influence on two key issues of international business; therefore, it provides more value to the discussion of AI role from an outsider perspective and how AI technologies could be implemented in firms. The paper offers a detailed account of global governance and international law on cross-border data. opia has added nearly pure value to entities incurring such perils and therefore accounts for one of the amazing values to world trade. Furthermore, the study presents a broader perspective of AI's impact on corporate law by documenting an intricate relationship between legal, organizational and society level conditions/effects with business adoption terrain.

Limitation and future work

The single geographic focus, US only, is a major limitation of this study. This limitation might not address all aspects of AI deployment and compliance in different global regions. Results of this study might not apply universally because of differences in legislations, infrastructure readiness and regulatory transparency. The research relied heavily on self-reported data collection via surveys, which can be subject to biases such as social desirability or personal feeling and are likely not an accurate measure of the truth. The article addressed the effects of AI on compliance and trade performance, ignoring ethical considerations of using AI which are more important now than ever at least in the AI & business law discourse such as algorithmic bias and transparency.

Future research should expand its focus to incorporate firms from different geographical regions, and thereby present a more comprehensive understanding of AI adoption in diverse legal systems. Furthermore, combining the longitudinal studies or secondary data might reduce some self-reported biases and offer an objective evaluation of AI pros on the compliance and trade performance across time. Subsequent research might analyse AI and its ethical implications on international corporate law, focusing on justice, accountability and transparency. A nuanced study of the impact of AI on fields such as dispute resolution and contract management in international business law would extend our understanding about how AI is shaping legal work and the geopolitics of global trade

Author contributions

Md Samirul Islam: Validation, Supervision, Software, Investigation, Conceptualization, Writing – review & editing, Writing – original draft, Visualization, Resources, Formal analysis, Data curation, Project administration, Methodology, Data curation.

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