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Technologies for Preventing, Detecting, and Combating Corruption

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EXECUTIVE SUMMARY

Corruption poses a persistent challenge across APEC economies, eroding public trust, distorting markets and undermining economic growth. As economies embrace digital transformation, new technologies present transformative opportunities to combat corruption. However, realizing the full potential of these innovations requires careful integration into institutional frameworks, consideration of contextual factors, and sustained collaboration across the region.

This report examines the current state and future potential of technologies for anti-corruption purposes within APEC, emphasizing the importance of aligning technological solutions with the three broad stages of the anti-corruption value chain: prevention, detection (including investigation), and sanction (including recovery of asset and denial of safe haven). By leveraging technology effectively at each stage, APEC economies can enhance transparency, accountability, and enforcement. This report is prepared for reference by APEC economies.

The report begins by contextualizing corruption's systemic impacts, detailing its economic, social, and institutional costs. It highlights the interconnected roles of governments, the private sector, international organizations, and citizens in creating an ecosystem that supports anti-corruption initiatives. While technology provides powerful tools for enhancing transparency, accountability and enforcement, if improperly implemented, it can support the development of more sophisticated forms of corruption and help evade detection. Its effectiveness depends on a holistic approach that considers proper integration with governance structures, and technical capabilities and infrastructure, to ensure effective use.

An analysis of **established technologies shows how solutions such as e-government platforms, open data initiatives, and automated compliance systems have already increased efficiency and transparency in governance**. These technologies reduce opportunities for corruption by streamlining administrative processes, enhancing public oversight, and creating digital records that are harder to manipulate.

Emerging technologies like artificial intelligence, blockchain and advanced data analytics (from classical computing methods to quantum mechanics principles) represent the next frontier in anti-corruption efforts. These tools offer powerful capabilities for detecting anomalies, securing transactions and automating investigative processes. However, if and when used with malicious intent, they can lend themselves to more advanced corrupt tactics. As such, technological capabilities have become imperative for anti-corruption bodies. Nonetheless, their implementation also poses challenges, including costs, ethical considerations and the need for robust governance frameworks.

Implementation readiness varies significantly across APEC economies due to differences in infrastructure, technical expertise, and institutional capacity. The report underscores the importance of addressing these disparities through targeted investments in capacity building, digital infrastructure, and knowledge-sharing initiatives.

While **technology is a critical enabler, the report emphasizes that it is not a standalone solution**. Effective anti-corruption strategies, including technology-enabled ones, require

strong institutions, clear regulations, and active public engagement as key components. Building public trust in digital systems and ensuring equitable access to technology are additional essentials for long-term success of technology-enabled strategies.

The report concludes with recommendations for APEC economies to optimize their use of technology in combating corruption. Key priorities include **embracing a strategic vision for anti-corruption technologies** that recognizes their potentials, limitations and risks, **designing context- and need-specific implementation plans** based on the readiness levels and **actively participating in and making use of regional cooperation initiatives**, such as those organized by APEC. Having a grasp of the available technologies at hand, each APEC economy should assess and develop a tailored approach that takes into account its resources and both short-term and long-term goals.

APEC's unique role as a convenor of regional efforts positions it to lead in providing strategic guidance for coordinated collaboration through technology utilization initiatives, facilitating capacity-building programs specifically designed to help participants gain user-level proficiency and understanding in various technologies, and supporting innovation in anti-corruption technologies through progress monitoring and evaluation.

Ultimately, this report demonstrates that the integration of technology into anti-corruption frameworks is both an opportunity and a responsibility for APEC economies. By acting decisively, economies can strengthen governance, enhance accountability, and set a global example of cross-border leadership in addressing corruption in the digital age.

1. INTRODUCTION

1.1. THE COST OF CORRUPTION

Corruption represents one of the most pressing challenges facing APEC economies.[1] While precise definitions vary, corruption fundamentally involves the deliberate misappropriation of entrusted authority for personal or illicit financial gain.[2] Its impact is systemic, undermining economic development, weakening institutions, and eroding social trust. The World Bank and International Monetary Fund (IMF) estimate that more than USD 2.6 trillion, or 5 percent of global GDP, is lost to corruption annually around the world. [3]

Corruption deters private investment and distorts market competition while diverting public resources into unproductive channels. This creates widespread inefficiencies and imposes a hidden "tax" on citizens and businesses, undermining economic growth. The problem extends far beyond economic policy, but many economists frame corruption as a public economic policy issue as it impairs the government's ability to execute its functions in the economy, such as providing goods and services, regulating markets, maintaining effective market regulation, and ensuring inclusive growth.[4]

More critically, the cost of corruption extends beyond the direct monetary losses and manifests across multiple dimensions. Institutionally, it erodes public trust and weakens regulatory effectiveness and enforcement capabilities, often leading to parallel informal governance systems that further undermine the rule of law.[5] Socially, corruption amplifies inequality by degrading public services and disproportionately affecting poorer households who lack the resources to navigate corrupt systems. This systemic unfairness breeds widespread cynicism about the value of good governance, and sows social discord.

On the flip side, curbing corruption can bring substantial fiscal benefits. It is found that between similarly developed economies, governments ranking lowest in corruption collect an additional 4 percent of GDP in tax revenue compared to governments with the highest corruption levels. Estimates also suggest that global anti-corruption measures could recover USD 1 trillion in lost tax revenues, representing 1.25 percent of global GDP.[6]

1.2. THE TYPES OF CORRUPTION

Corruption manifests in multiple forms across public and private sectors. The primary categorization distinguishes between conventional corruption, involving multiple parties in reciprocal arrangements (like bribery), and unconventional corruption, involving direct misappropriation by individual actors (like embezzlement).[7] Within conventional corruption, acts can be categorized by scale – from petty corruption involving small-scale routine transactions to grand corruption involving high-level officials and significant resources.

Political corruption, which involves the manipulation of policies and institutions by political and economic elites, typically overlaps with grand corruption but is distinguished by its focus on systemic policy manipulation. Cross-border corruption adds layers of complexity to both conventional and unconventional forms, often involving sophisticated networks that exploit

jurisdictional gaps and differences in legal frameworks across multiple economies. See Table 1.2 for a breakdown of the types of corruption.

Table 1.2 Types of corruption

Primary Category	Scale	Description	Examples
 Conventional Corruption	Petty	Small-scale corruption in routine transactions by low-level officials	Civil servant demanding bribes for permits; Customs officers accepting bribes to allow illegal goods through borders; Border agents taking payments to expedite crossings
	Grand/Political	Large-scale corruption by high-level officials and political/economic elites, often involving policy manipulation	Minister rigging contract awards; Politicians changing laws for private gain (self and cronies); Corporations bribing officials across multiple economies for acquiring licenses
 Unconventional Corruption	Any scale	Direct misappropriation of resources without reciprocal arrangements	Official embezzling public funds; Theft of government assets; International aid funds being diverted

Source: Access Partnership research/analysis

The challenge of corruption is persistent and self-reinforcing. As institutions weaken, opportunities for corruption multiply, creating cycles of deteriorating governance. This persistence of corruption, combined with its multi-faceted negative impacts, makes developing effective counter-measures – particularly through emerging technologies – an urgent priority for APEC economies.

Recognizing the gravity of this issue, APEC Leaders have adopted a proactive stance in combating corruption. This commitment is evident in several regional initiatives, including the establishment of the Anti-Corruption and Transparency Experts Working Group (ACTWG) and its Anti-Corruption Authorities and Law Enforcement Agencies Network (ACT-NET), which has become a best practice model replicated in other parts of the world. These efforts are further supported by regional programs from organizations such as the United Nations Office on Drugs and Crime (UNODC), the Asian Development Bank (ADB), and the Organization for Economic Co-operation and Development (OECD).

The ACTWG has a comprehensive scope of work and strategy for the 2023-2026 period.[8] The group is primarily responsible for implementing APEC's anti-corruption and transparency commitments, which include various declarations and action plans adopted by APEC Leaders over the years. A key focus of the ACTWG is facilitating the exchange of information between anti-corruption experts on the implementation of domestic anti-corruption commitments and the promotion of successful practices to combat corruption.

The ACTWG plays a crucial role in promoting cooperation between APEC members in the fight against corruption. This cooperation encompasses technical assistance, extraditions, mutual legal assistance, and collaboration in judicial and law enforcement matters, with a particular emphasis on asset forfeiture and recovery. As the group works to facilitate the

implementation of the United Nations Convention against Corruption (UNCAC) by relevant member economies, it is interesting to note the findings and challenges identified[9] in the region, including the lack of technological know-how to enhance their efforts in investigative techniques and legal enforcement.

Recognizing the evolving nature of corruption, the ACTWG seeks to address new and emerging anti-corruption issues related to technology, crises, or changing environments. As such, this report provides a comprehensive overview of the available technologies and how they can be used to enhance the efforts across the entire anti-corruption "value chain," encompassing prevention, detection, investigation, litigation, asset recovery, and denial of safe harbor.

1.3. THE ANTI-CORRUPTION VALUE CHAIN

The anti-corruption value chain provides a framework for understanding how different interventions work together to combat corruption.[10] This framework recognizes that effective anti-corruption efforts require coordinated action across three main sequential stages: (i) prevention, (ii) detection (including investigation), and (iii) sanction (including asset recovery and denial of safe haven).

Outlined in Table 1.3 below are the core objectives of each stage and the role that technology can play.

Table 1.3 Stages of the anti-corruption value chain and the role of technology

Stage	Core objectives	Role of technology	Examples
 **Prevention**	Focuses on **proactively deterring** corrupt practices before they occur. This involves establishing robust policies, implementing transparent processes, and creating a culture of integrity.[11]	Serves to automate compliance systems, enhance transparency in processes, and create digital barriers to corrupt practices. It can also reduce human intervention in sensitive areas, thereby minimizing opportunities for corruption.[12]	Korea's e-procurement platform, Korea ON-line E-Procurement System (KONEPs), has digitized the entire procurement process, removing direct contact between suppliers and purchasers. All the bid requirements are publicly accessible, with every document transparently tracked and recorded. KONEPs has been exported to nine economies so far.
 **Detection**	**Identifying** corrupt practices when they occur. This includes monitoring transactions, analyzing data for anomalies, and facilitating reporting and whistleblowing mechanisms.	Acts as a vigilant observer, continuously monitoring vast amounts of data to identify patterns and anomalies that may indicate corrupt activities. It also provides secure channels for reporting suspicious activities.[13]	Spain's General Comptroller of the State Administration (IGAE) utilizes supervised machine learning to identify high-risk public grants to combat fraud. By focusing on predicted high-risk cases for investigation, IGAE effectively allocates its

Stage	Core objectives	Role of technology	Examples
			resources, enhancing the overall efficiency of fraud detection efforts.
 **Sanction**	Encompasses punitive measures against corrupt actors to **halt** corrupt practices, and efforts to **recover** assets and **deny** safe haven. It involves legal proceedings, international cooperation, and mechanisms to recover stolen assets.[14]	Serves as a tracking and recovery tool. It aids in uncovering digital evidence, tracing financial transactions across complex networks, and coordinating international efforts to deny safe haven to corrupt individuals.[15]	The United States utilizes its Consolidated Asset Tracking System (CATS), which leverages standardized processes and integrated workflows, to facilitate asset management and asset forfeiture across multiple agencies. Additionally, the United States maintains an electronic case management system for tracking the status of all mutual legal assistance and extradition requests received or sent by the United States.

Source: Access Partnership research/analysis

Throughout all stages, technology enhances information sharing and collaboration among various stakeholders, streamlines processes, and improves the efficiency and effectiveness of anti-corruption efforts. Given the distinct objectives of each stage of the value chain, different technologies can be assessed against criteria such as functionality, impact, ease of implementation, scalability, cost-effectiveness, or user accessibility. This assessment ensures that each technology is deployed where it can exert maximum impact, thereby enhancing the overall efficacy of anti-corruption initiatives. For example, technologies that digitize government services, such as e-government platforms, are better suited for deployment in the prevention stage as they can reduce human interaction points where corruption opportunities may arise. Meanwhile, artificial intelligence and machine learning tools are excellent at analyzing large datasets to identify patterns and anomalies that may signify corrupt behaviors, making them effective detection technologies. Ultimately, a well-coordinated approach leverages the strengths of various technologies across all stages of the value chain, considering the context and need on the ground, to combat corruption comprehensively and sustainably.

Nonetheless, while technology is a powerful tool in the anti-corruption arsenal, it is not a panacea. Success requires combining technological tools with strong institutions, clear policies, and committed leadership. Furthermore, technology itself can be a double-edged sword – while it can strengthen anti-corruption efforts, it can also enable new forms of corruption through sophisticated digital schemes, cryptocurrency-based money laundering, and cyber-enabled fraud, underscoring the need for continuous adaptation of anti-corruption strategies.

1.4. THE ROLE OF PUBLIC AND PRIVATE SECTOR ACTORS, INTERNATIONAL ORGANIZATIONS, AND CITIZENS

Effective anti-corruption efforts require coordinated action from four key stakeholder groups: (i) government agencies, (ii) private sector organizations, (iii) international bodies, and (iv) citizens. Each group plays distinct but complementary roles across the anti-corruption value chain, as outlined below and in Table 1.4.

Government agencies, law enforcement officials and judiciary serve as primary actors, establishing regulatory frameworks and implementing technological solutions. They can lead through e-government initiatives, deploy automated compliance systems, and ensure legal frameworks accommodate technologically derived evidence. Their role ranges from introducing preventive measures like digital public services to promote transparency, to conducting enforcement actions, including asset recovery and prosecution. For example, India's Comptroller and Auditor General created the Centre for Data Management and Analytics to enhance corruption detection through data analytics, enabling targeted audits that have strengthened government accountability (refer to Section 4 for more detail).

Private sector organizations play a dual role as both technology providers and compliance practitioners. They develop and implement anti-corruption solutions while maintaining their own compliance programs.[16] Their contributions include developing detection technologies, operating secure transaction platforms, sharing financial intelligence with authorities, and helping trace illicit assets through their financial networks.[17] Microsoft, for instance, has developed AI-driven risk detection systems that analyze risk signals across various business activities as well as an AI-powered compliance assistant that offers immediate, policy-based guidance to employees.

International organizations (IOs) act as standard-setters and facilitators of cross-economy cooperation. Furthermore, many IOs exercise the role of secretariat to some of the most important anti-corruption conventions – e.g. UNODC is the guardian to UNCAC and the Secretariat to the UNCAC Implementation Review Mechanism, while the OECD acts as the secretariat to the OECD Anti-Bribery Convention – ensuring the implementation of and compliance with these agreements. They develop model legislation, promote best practices, and coordinate multi-jurisdictional efforts including capacity-building and knowledge sharing. Their work is particularly crucial in addressing cross-border corruption through implementing or encouraging shared intelligence and coordinated enforcement actions. An example is the World Bank's Governance Risk Assessment System (GRAS) which employs advanced data analytics to detect fraud, corruption, and collusion in government contracting, and was piloted in Brazil (refer to Section 4 for more detail).

Citizens play an important role in demanding and maintaining government accountability. As the ultimate stakeholders in public governance, they drive anti-corruption efforts through political participation, civil society engagement, and direct oversight of public institutions. Their activities include reporting corruption, participating in public consultations, demanding transparency reforms, and exercising their right to access public information. Digital platforms have enhanced these traditional roles providing new tools for engagement, monitoring and reporting. In Singapore, the Corrupt Practices Investigation Bureau (CPIB) facilitates citizen engagement in anti-corruption efforts through its eComplaint Portal, which allows for

confidential reporting of corruption and received 215 reports in 2023 (refer to Section 3 for more detail). The South-East Asian Anti-Corruption Network for CSO (SEA-ACN),[18] facilitated by Knowledge Hub for Regional Anti-Corruption and Good Governance Collaboration (KRAC) under Thailand's Chulalongkorn University in Bangkok, established by UNODC works to facilitate the sharing of experiences and lessons in advocating for reforms and greater transparency and accountability. The Journalists Against Corruption (JAC)[19] network is facilitated by the Philippine Centre for Investigative Journalism and serves as a platform for interested journalists to come together, receive substantive training, and collaborate.

Table 1.4 Main roles of key stakeholders in the anti-corruption value chain

Stage	Government	Private sector	International organizations	Citizens
 **Prevention**	Government-led regulatory frameworks and e-government solutions	Private sector compliance systems and due diligence tools	International standards and capacity-building programs	Public participation in oversight and accountability processes
 **Detection**	Government deployment of monitoring and investigation capabilities	Private sector threat intelligence and analytical tools	International coordination of cross-border monitoring	Reporting corruption and monitoring public services
 **Sanction**	Government enforcement and prosecution mechanisms	Private sector support for asset recovery and sanctions	International facilitation of legal cooperation	Supporting investigations and maintaining accountability pressure

Source: Access Partnership research/analysis

1.5. ESTABLISHED VS. EMERGING TECHNOLOGIES

This report has found that anti-corruption efforts rely on both established and emerging technologies, which can be differentiated by their maturity, adoption levels, and supporting infrastructure. This distinction is key for understanding implementation requirements and potential impact.

In this report, **established technologies** are technologies that form the foundation of current anti-corruption efforts, characterized by widespread adoption, documented effectiveness, and well-developed support ecosystems, including a skilled workforce capable of implementation and maintenance.[20] These include digital service delivery platforms, basic data analytics, and standard reporting systems that have demonstrably reduced corruption opportunities through process automation and enhanced transparency.[21]

In contrast, **emerging technologies** are innovative solutions that are still in early development stages, characterized by rapid evolution, significant potential impact, and considerable uncertainty in their implementation and effects.[22] Unlike established technologies, their full implications are still unfolding, creating both opportunities and challenges for adoption. Emerging technologies, particularly artificial intelligence (AI)/machine learning (ML) and

blockchain, are transforming anti-corruption capabilities.[23] AI/ML enables advanced pattern recognition, predictive analytics, and automated monitoring systems that can detect corruption indicators more effectively than traditional methods. Blockchain technologies are tampering-proof digital ledgers that offer unprecedented transparency and traceability through immutable record-keeping and smart contracts. These powerful tools often require significant expertise and infrastructure investment for successful deployment.

Presented in Table 1.5 below is an overview of the various established and emerging technologies utilized for anti-corruption purposes. These will be further discussed in Sections 3 and 4, respectively.

Table 1.5 Established and emerging technologies for anti-corruption

Established Technologies		Emerging Technologies	
Web Technologies and Digital Services	• E-government portals and digital ID systems • Digital Whistleblowing platforms	**AI/ML**	• Enhanced Anti-corruption Training Programs • Pattern Detection and Anomaly Identification • Asset Tracking
Information Management Systems	• Open data platforms and databases • Case management systems • Asset tracking and Recovery systems	**Advanced Data Analytics**	• Predictive analytics • Forensic tools
Basic Analytics and Monitoring Software	• Basic forensic tools • Anomaly detection and rule-based methods	**Blockchain**	• Technology-supported supply chain monitoring • Blockchain analytics tools
		Facial Recognition	• Monitoring Access • Network Mapping
		Drones and Remote Sensing	• Document environmental compliance • Detecting unauthorized or illegal activities

Source: Access Partnership research/analysis

It should be noted that the boundary between established and emerging technologies is increasingly fluid. For example, AI is enhancing traditional e-procurement platforms with automated risk assessment, while blockchain technology is being integrated into existing asset-tracking systems. This evolution creates opportunities for organizations to gradually upgrade their anti-corruption capabilities while building on established foundations.

1.6. SUMMARY OF REPORT STRUCTURE AND KEY ARGUMENTS

This report examines how APEC economies can leverage both established and emerging technologies to strengthen their anti-corruption efforts.

Section 2 analyzes the current institutional landscape for anti-corruption efforts for APEC's context. It examines existing cross-border mechanisms and frameworks, highlighting how these structures enable and/or constrain technology adoption. The section also explores some economy-level institutional approaches to implementing anti-corruption technologies.

Section 3 focuses on established technologies like e-government platforms, beneficial ownership registries, and data analytics systems. For each technology category, the analysis examines implementation across the value chain, highlighting successes and limitations that create opportunities for emerging technologies.

Section 4 explores how emerging technologies including AI, blockchain, and advanced analytics are transforming anti-corruption capabilities. The analysis demonstrates how these technologies build on established foundations while offering new capabilities for prevention, detection, and sanction.

Section 5 provides a detailed assessment of APEC economies' readiness to adopt technology for anti-corruption, examining factors such as technical infrastructure, institutional capacity, and governance frameworks. The analysis identifies significant variation across economies, reflecting diverse levels of preparedness and resource availability. These differences present both challenges, such as addressing gaps in capability, and opportunities to foster regional cooperation, knowledge sharing, and capacity building, to collectively enhance anti-corruption efforts.

Section 6 provides practical recommendations for enhancing the effectiveness of anti-corruption technology adoption across APEC. These focus on addressing cross-cutting implementation requirements, leveraging opportunities while mitigating risks, and fostering regional cooperation to accelerate adoption.

Key Points

1. Technology is transforming both sides of the corruption battle. While it provides powerful tools for transparency, accountability and enforcement, it can also enable sophisticated forms of corruption and help evade detection. Its effectiveness in fighting corruption depends on proper integration with (i) robust governance structures, to foster accountability and trust, and (ii) technical capabilities and infrastructure, to ensure effective use. A holistic approach recognizes that technology is but one element of a multifaceted strategy to effectively combat corruption and promote integrity.
2. Technology can often serve different roles across the various stages of the anti-corruption value chain (prevention, detection, and sanction), highlighting the need for context-sensitive deployment across all stages. If coordinated, these deployments can result in greater efficiency and impact.

3. The boundary between established and emerging technologies is also increasingly fluid, presenting organizations with the opportunity to gradually upgrade their anti-corruption capabilities while building on established foundations.
4. APEC economies display significant variation in their readiness to adopt advanced anti-corruption technologies. Tailored implementation strategies must address these differences, with the aim of leveraging strengths and fostering collaborative approaches that promote mutual capacity building, both in governance and innovation.
5. Regional cooperation and knowledge sharing are critical to overcoming shared challenges, harmonizing technological approaches, and maximizing the impact of anti-corruption initiatives. Further solidifying these in a strategic multi-year plan would be valuable for organizational vision and sustainability of efforts.
6. Effective use of technology requires balancing the pursuit of innovation with the practical considerations of capacity, particularly the upskilling of individuals using these tools, resources, and governance. Based on the collective awareness that technology should be used to augment, not replace, human judgment, this approach minimizes risks and ensures sustainable, equitable outcomes when encouraging greater utilization of technology for anti-corruption efforts.

2. THE CURRENT ANTI-CORRUPTION LANDSCAPE: INSTITUTIONAL MECHANISMS

2.1. CURRENT CROSS-BORDER INSTITUTIONAL SETUP

This section delineates the role of institutional mechanisms in combating corruption across borders, with a focus on the integration of advanced technologies. By examining international frameworks and conventions, this section aims to uncover the foundations upon which global anti-corruption efforts are built. Through the analysis of agreements like the United Nations Convention against Corruption (UNCAC) and the OECD Anti-Bribery Convention, this section aims to summarize how – and if – these arrangements can help set up strategies to leverage modern technologies for enhancing cooperation and effectiveness in the fight against corruption. This section also elaborates on the parallel networks led by international organizations (see Table 2.1) to enhance and maximize the use of technology and achieve their objectives.

Table 2.1 Summary of international organizations' anti-corruption efforts related to technology

Organization	Anti-Corruption Framework or Initiative	Related Work or References to the Use of Technology
United Nations (UN)	United Nations General Assembly Special Session (UNGASS) on anti-corruption	• The UNGASS 2021 Political Declaration acknowledges the significant role of technology in supporting anti-corruption efforts. Specifically, it states: "We recognize the role that technologies can play in support of anti-corruption measures, including in public procurement and with regard to asset and conflict of interest declarations by public officials to appropriate authorities, in accordance with the fundamental principles of domestic law, to promote transparency, interaction with citizens and accountability, and the importance of strengthening cooperation and the exchange of best practices on the development and application of such technologies."

Organization	Anti-Corruption Framework or Initiative	Related Work or References to the Use of Technology
United Nations Office on Drugs and Crime (UNODC)	United Nations Convention against Corruption (UNCAC)	• UNCAC fosters cross-border cooperation in areas such as asset recovery, mutual legal assistance, and law enforcement collaboration. It also sets universal principles for corruption prevention, criminalization of corruption offences, law enforcement and asset recovery. • Adopted in 2003, the UNCAC has very limited references to technology use. Article 48 states that members shall cooperate within their means to respond to offences covered by the Convention committed through the use of modern technology. Article 50 notes the use of "other special investigative techniques, such as electronic or other forms of surveillance and undercover operations" and encourages parties to conclude agreements/arrangements for the use of such special investigative techniques at the international level. • However, no further reference or recommendation can be found in the Convention.
	GlobE Network	• The GlobE Network is open to anti-corruption law enforcement authorities from several UN members and parties to the UNCAC.[24] • GlobE leverages technology to support its members and achieve significant outcomes in various areas, including communication, data management and analysis, education and citizen engagement.[25] • The GlobE Network's Secure Communication Platform (SCP) is an online platform that facilitates interaction and information sharing.[26] • Conducts capacity-building session on technology uses. • The Directory of Open-Source Registries is an online platform designed to streamline anti-corruption investigations.[27]

Organization	Anti-Corruption Framework or Initiative	Related Work or References to the Use of Technology
Organization for Economic Co-operation and Development (OECD)	Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (Anti-Bribery Convention)	• Adopted in 1997, the Convention focuses on combating the bribery of foreign public officials in international business transactions by establishing legally binding standards to criminalize bribery. • No references to the use of technology in the Convention. The Recommendations[28] to the OECD Convention include some references to the use of technology, recognizing its potential role in advancing public and private sector efforts to combat foreign bribery. For example, the Recommendation encourages companies to utilize "innovative technologies" as part of their internal controls to identify patterns that may indicate foreign bribery. Furthermore, the Recommendations highlight the impact that technology can have in mutual legal assistance processes.
	Global Law Enforcement Network against Transnational Bribery (GLEN) Regional Law Enforcement networks: ACN LEN, LAC LEN, AP LEN and Africa LEN.	• GLEN was established to strengthen worldwide enforcement actions against sophisticated cross-border corruption crimes. • The regional networks aim to help their specific geographical areas, by bringing both members and non-members of the OECD Anti-Bribery Convention to share their experiences and ideas. ACN focuses on strengthening anti-corruption measures across Eastern Europe and Central Asia, LAC LEN focuses on Latin America and the Caribbean, AP LEN on Asia Pacific and Africa LEN on the African region. • These law enforcement networks enable law enforcement officials to build professional relationships and engage in confidential discussions about real-world cases. Law enforcement officials also participate in peer learning sessions, sharing effective investigation techniques and proven practices in tackling corruption. • Although law enforcement networks have extensively worked on different aspects to tackle corruption, only limited

Organization	Anti-Corruption Framework or Initiative	Related Work or References to the Use of Technology
		references to the use of technology have been identified. In particular, the ACN LEN is about to launch an online LEN community, a SharePoint space with restricted access for law enforcement officials, which will be used for sharing the confidential LEN materials, a regularly updated list of law enforcement contacts, and a database (Matrix) of high-level corruption cases.[29]
Asia-Pacific Economic Cooperation (APEC)	APEC Anti-Corruption and Transparency Experts Working Group (ACTWG)	• The ACTWG coordinates and implements APEC commitments and facilitates the implementation of the international anti-corruption obligations. • The Strategic Plan 2023-2026[30] establishes the commitment to discuss the uses of technologies and its challenges. • Conducts capacity-building activities focused on technology.[31]
	Network of Anti-Corruption Authorities and Law Enforcement Agencies (ACT-NET)	• An informal network connecting regional anti-corruption and law enforcement officers to enhance cross-border cooperation. • Enhances information exchange, capacity building, asset recovery and fosters collaboration between law enforcement agencies.

Source: Access Partnership research/analysis

The UNCAC and the OECD Anti-Bribery Convention are key international frameworks for harmonizing cross-border anti-corruption efforts. Despite over two decades of implementation and regular updates through recommendations and guidelines, neither convention provides specific guidance on leveraging technology to enhance anti-corruption efforts and international cooperation. Although the conventions do not include any reference, the reviewing processes have raised these issues. For example, the UNCAC Implementation Review Mechanism, which examines implementation of UNCAC by its parties, identified significant technical assistance needs related to the use of technological tools for data gathering and analysis. These included needs in relation to technological assistance for the establishment and strengthening of electronic record-keeping systems and database management; the digitalization of court records to facilitate asset recovery; and the use of technologies for strategic analysis to decipher underlying trends, threats, and vulnerabilities for the purpose of preventing money laundering and the financing of terrorism.[32]

More concrete technological applications are found in parallel initiatives led by international organizations' law enforcement networks. For example, the UNODC's GlobE Network which

has a Secure Communication Platform (SCP)[33] that empowers Network members to tackle cross-border corruption cases by facilitating the swift and secure exchange of information. This online platform serves as the foundation for global connectivity and real-time interactions, enabling members to share information and solve problems across geographical boundaries.

Furthermore, the GlobE Network has organized a series of capacity-building and training sessions for their members, with a focus on key technological domains, including open-source intelligence, internet investigations, and cryptocurrency analysis. In particular, the Network's approach to digital assets exemplifies its forward-thinking methodology, emphasizing that cryptocurrencies can enhance financial transaction transparency when properly leveraged.

The GlobE Network's infrastructure also includes a centralized database that stores and organizes scientific data from various GlobE projects, complemented by sophisticated visualization tools that help members interpret complex environmental information. These systems are supported by comprehensive educational resources, including standardized online training modules and interactive virtual learning environments that facilitate remote skill development. For example, in 2024, the Directory of Open-Source Registries was launched as an innovative online platform designed to streamline anti-corruption investigations. [34] This tool addresses a critical challenge faced by law enforcement authorities: the difficulty in locating and accessing official public records needed to investigate transnational corruption. By consolidating information from GlobE Network member economies, the Directory provides a centralized access point to digital registries across 65 jurisdictions. These registries contain essential data for detecting, investigating, and prosecuting corruption offenses that cross borders.

2.1.1. APEC

APEC’s efforts in fostering cross-border cooperation have also been globally recognized, with the Network of Anti-Corruption Authorities and Law Enforcement Agencies (ACT-NET) making significant achievements in enhancing cross-border cooperation and combating corruption across the Asia Pacific region, such as enhancing information exchange,[35] capacity-building,[36] asset recovery,[37] and fostering collaboration.[38]

The APEC Anti-Corruption and Transparency Experts Working Group (ACTWG)’s Strategic Plan 2023-2026,[39] where the members established their vision of creating an inclusive APEC community united in its commitment to preventing and combating corruption, recognizes technology as one of the "new and emerging anti-corruption issues" that require attention and adaptation. The group commits to discussing these technological developments and creating projects to address them while encouraging members to share their expertise and experiences in handling technology-related challenges. Moreover, as part of implementing the APEC Putrajaya Vision 2040,[40] the Plan also specifically calls for "applying innovative and digital approaches in the anti-corruption domain" as tools for prevention and combat of corruption.

The ACTWG merits recognition for integrating technology within a holistic anti-corruption framework. The Strategic Plan acknowledges technology's growing importance in anti-corruption efforts, but does not provide detailed specifics about technological implementation. Instead, it positions technology as an evolving tool that will be developed and refined through future projects and initiatives. This approach suggests that the ACTWG sees technology as one

component of a broader strategy that combines innovative solutions with traditional anti-corruption methods. The Plan also reflects an understanding that effective anti-corruption efforts require a balanced approach, where technological solutions complement and augment, rather than replace, established practices of international cooperation, capacity building, and public-private partnerships.

The ACTWG has worked extensively with member economies to help them embrace technology in the fight against corruption. A recent example is the organization of the "Workshop on Technology for Transparency: Digital Disruption to Corruption" and the publication of its outcomes.[41] As outlined in Figure 2.1.1, this workshop emphasized the importance of digital tools and data analytics in anti-corruption efforts, including:

Figure 2.1.1 Digital tools in anti-corruption

 **Data Analytics**	Can be utilized to predict and deter corruption risks, enhance transparency in public services and procurement, detect irregularities, and identify conflicts of interest.
 **Blockchain and Cryptocurrencies**	Were discussed for their dual role in both facilitating and combating corruption. Blockchain can enhance transparency in transactions, while cryptocurrencies pose challenges due to their potential misuse for money laundering.
 **Digital Public Services and e-Government Systems**	Were highlighted as crucial for promoting transparency and efficiency in public administration. Examples include digital public services, electronic government systems, and digital procurement platforms. However, it is essential to build a controlling environment for digital solutions from a system approach, integrating various digital platforms to avoid redundancy and facilitate user accessibility. Trust and confidence in government digital systems must be ensured while balancing efficiency and privacy protection.
 **Whistleblowing Tools**	Such as China's WeChat reporting system and Korea's Clean Portal, were also discussed as effective means for reporting corruption.
 **Specific Technologies and Systems were Showcased**	Including Korea's Digital Anti-Corruption System (Clean Portal) for reporting corruption, Singapore's Digital Investigation Paper (Digital IP) initiative to digitize investigation processes, and experiments in Colombia and Korea using blockchain to ensure transparency and prevent tampering in public procurement processes.

Source: Access Partnership research/analysis

2.1.2. Summary

Although it is clear that several technologies are emerging to help authorities tackle corruption, many of the current frameworks described in this section were drafted when technology did not have such a prominent role. Instead, guidance on technological implementation has often

emerged through auxiliary initiatives and projects, rather than within core conventions themselves.

The international community, from the private sector and civil society to public authorities, has increasingly advocated for technological integration to enhance anti-corruption objectives, leading to updated recommendations and protocols. To achieve this, technical assistance is necessary to address the fundamental digital divide and ensure that economies are more adequately equipped to utilize digital solutions for anti-corruption. International and multilateral organizations like APEC can play a critical role in supporting economies in navigating digitalization challenges by fostering cross-border capacity-building and collaboration between them.

Nevertheless, varying levels of economic development, as illustrated in Section 5, may pose differing challenges to greater technology adoption. Through multifaceted efforts that not only take into account but leverage these differences, APEC can help transform digital challenges into opportunities for collaborative growth and tangible impact, creating a more robust and adaptive approach to combating corruption in the digital age.

2.2. ECONOMY-LEVEL INSTITUTIONAL APPROACHES TO ADOPTING ANTI-CORRUPTION TECHNOLOGIES

Governments in APEC are increasingly recognizing technology's potential to combat corruption, adopting a range of institutional arrangements to effectively implement and manage these tools.[42] This section discusses key areas where governments have focused, highlighting the importance of a holistic approach that integrates technological solutions with broader anti-corruption strategies.

Legal and Institutional Frameworks

A comprehensive, multi-stakeholder approach to combating corruption has emerged as a leading practice, with solutions customized to each economy's specific circumstances. This approach often centers on developing and implementing an Anti-Corruption Strategy (ACS), with technology integration playing a crucial role in its effectiveness. Malaysia provides a recent example of this integration in its Anti-corruption Strategy for 2024-2028. The strategy specifically calls for implementing "an integrated procurement system that leverages emerging technologies including digital financial platforms, artificial intelligence, cloud computing, and end-to-end processes" to enhance public accountability. Additionally, in its enforcement strategy, the Malaysian Government plans to deploy technology-driven equipment in detention centers.

Successful anti-corruption technology adoption also requires a robust legal and regulatory framework that prioritizes transparency and accountability and enhances citizens' trust.[43] These frameworks should create an environment where technology can be used effectively and ethically. APEC governments have been working to establish clear legal guidelines for data privacy and protection, particularly when implementing surveillance technologies.[44]

For example, the Act on the Protection of Personal Information in Japan provides a robust framework for personal data collection[45] and New Zealand's Privacy Act (2020) enhances individual privacy rights and imposes obligations on organizations, including provisions that

address the implications of surveillance technologies.[46] Frameworks such as access to information laws and data protection regulations have helped to ensure the responsible use of data while supporting transparency initiatives.[47] These frameworks not only guide the actions of government agencies but also foster public trust in the use of technology for anti-corruption purposes.

Capacity Building and Training

To harness the full potential of anti-corruption technologies, APEC governments have been investing in capacity building and training programs.[48] For example, the Australian Public Service Commission offers the Digital Literacy Capability program, equipping public servants with skills in data analysis and digital tools to support transparency and anti-corruption efforts.[49]

In Indonesia, the Corruption Eradication Commission (KPK) conducts regular training for government officials on the use of electronic procurement systems and data analytics to detect and prevent corruption. Public officials require adequate technical skills to operate, maintain, and interpret data from these technologies. Training programs should also go beyond technical aspects, encompassing ethical considerations and best practices for data management and security.[50] Investing in continuous professional development ensures public officials stay abreast of rapidly evolving technological advancements and effectively adapt to new tools and strategies.

Public Awareness and Engagement

Citizen participation is a crucial element in the fight against corruption.[51] APEC governments are working to actively engage the public and raise awareness about the use and benefits of anti-corruption tools and technologies and using them to facilitate awareness raising and educating citizens. Open data platforms and user-friendly mobile applications have been used to empower citizens to report corruption, monitor public services, and access information, fostering a culture of transparency and accountability.[52]

For example, in Mexico, the government launched a public procurement digital platform, an open data initiative that allows citizens to access information on public procurement processes and government contracts, promoting transparency and accountability, as well as strengthening the public information quality.[53] Taking a creative approach, Singapore's Corrupt Practices Investigation Bureau (CPIB), in collaboration with students from Nanyang Polytechnic's School of Design and Media, developed a web game named "Corruzione".[54] The game can be accessed through the CPIB's website and aims to educate players about the consequences of corruption in an engaging and interactive format. Similarly, Malaysia's Anti-Corruption Commission (MACC) has also utilized technology to create an educational mobile game called "MACC AR," which employs augmented reality to educate the public and build support for anti-corruption efforts.[55]

Technology is a powerful tool in the fight against corruption but must be integrated into a comprehensive strategy.[56] APEC governments must continue to address the underlying causes of corruption and foster a culture of integrity alongside technological solutions. This involves strengthening institutions, promoting ethical behavior within the public sector, and enacting broader anti-corruption reforms.[57] A holistic approach recognizes that technology is one element of a multifaceted strategy to effectively combat corruption and promote integrity.[58]

3. ESTABLISHED TECHNOLOGIES IN APEC

This chapter focuses on the established technologies that have been used to date with the aim of combating corruption. Some of these technologies were introduced decades ago and represent initial efforts to digitize procedures and use technology as a tool and ally to combat corruption.

While APEC economies employ diverse technological solutions in their anti-corruption efforts, this section focuses on three major groups of established technologies with use cases that have demonstrated adoption and impact across the region. These groups are:

1. **Web-Based Technologies and Digital Services**: These are online platforms and systems that enable secure and transparent digital interactions across government and organizational systems. These technologies provide centralized access to services and standardization of processes, such as in procurement platforms. They also create digital channels for reporting and disclosure of information, helping to track and investigate potential corrupt behavior.
2. **Information Management Systems:** These are digital infrastructures designed to collect, organize, store, and categorize vast volumes of structured and unstructured data from multiple sources. They integrate data from various departments and institutions, providing capabilities for data and case management. These systems should feature robust data security, sophisticated search functionalities, and automated classification mechanisms to support comprehensive and efficient information processing.
3. **Basic Analytics and Monitoring Software** are tools that enable the systematic examination of organizational data to identify anomalies and potential irregularities. They utilize statistical methods and predefined rule sets to scan transactional data and generate evidence-based insights. These tools support risk management enabling data-driven investigative responses to potential corrupt practices.

These technologies have achieved significant scale, demonstrated clear anti-corruption impact, and built robust implementation frameworks across multiple APEC economies. They also provide the foundation that many emerging technologies (see Section 4) can leverage to enhance the government's ability to fight corruption.

The following analysis examines how the use of these technologies maps to different stages of the anti-corruption value chain, their implementation challenges and opportunities, and their current limitations. This understanding is crucial for APEC economies seeking to strengthen their technological foundation for fighting corruption while preparing for next-generation solutions.

3.1. MAPPING OF ESTABLISHED TECHNOLOGIES AGAINST THE ANTI-CORRUPTION VALUE CHAIN

Table 3.1 below presents an overview of the various established technologies currently explored in the context of the three stages of the anti-corruption value chain.

Table 3.1 Established technologies and their uses across the three value chain stages

	Prevention	Detection	Sanction
1. **Web Technologies and Digital Services**	• E-government portals and digital ID systems • E-procurement platforms	• Digital Whistleblowing platforms	
2. **Information Management Systems**	• Open data platforms and databases • Beneficial ownership registers	• Case management systems	• Asset tracking and Recovery systems • Case management systems
3. **Basic Analytics and Monitoring Software**		• Basic forensic tools • Anomaly detection and rule-based methods	

Source: Access Partnership research/analysis

3.1.1. Prevention

3.1.1.1. Established Technology 1: Web Technologies and Digital Services

E-Government Portals and Digital Identity (ID) Systems

Over the past two decades, governments worldwide have implemented various **e-government initiatives** that use digital technologies to enhance their internal operations and improve service delivery systems.[59] These e-government initiatives encompass a wide range of technological solutions aimed at modernizing public services, enhancing efficiency, and fostering transparency in interactions with citizens.

Governments' use of ICT tools reduces corruption by improving efficiency and promoting e-participation.[60] Additionally, digital records also play a crucial role in helping to regulate fraud or irregular practices.[61] As such, e-government solutions are one of the most promising methods of preventing corruption.[62] Empirical evidence suggests a correlation between e-government adoption and reduced corruption in public services,[63] particularly petty corruption.[64] This reduction occurs primarily through two mechanisms. First, enhanced transparency increases accountability and detection risk. Second, streamlined administrative processes minimize direct citizen-public official interactions, reducing opportunities for corrupt behavior.

Nonetheless, it is crucial to acknowledge that the adoption of digital services is not inherently or automatically beneficial. The impact on corruption depends heavily on the solution, its implementation quality and whether anti-corruption measures are explicitly built into the system design. Moreover, such digital solutions must consider institutional capabilities, provide comprehensive training for government employees, ensure system security, and,

crucially, focus on demand-side considerations that address the digital divide and local technological readiness.[65] These considerations are further explored in Section 5 of the report. **Digital ID systems** can also play an important role in the fight against corruption, offering accountability and verification in government and administrative processes. Systems that "meet high technology, organization, and governance standards can improve trustworthiness, security, privacy, and convenience in identifying natural persons in a wide variety of settings, such as financial services, health, and e-government in the global economy of the digital age."[66]

By providing a unique, verifiable digital ID for individuals, these systems can mitigate fraudulent activities, such as identity theft and document forgery, by creating a layer of authentication. They can also enable governments to establish clear and traceable interactions between citizens and public services, reducing opportunities for bureaucratic intermediaries to demand bribes or manipulate processes.

Nonetheless, while digital ID systems can play a role in anti-corruption, they are not without risks. Potential vulnerabilities include cybersecurity threats and the possibility of sophisticated identity manipulation with the misuse of systems.[67] Successful implementation requires comprehensive technological safeguards, stringent governance protocols, and continuous system monitoring to minimize potential systemic risks. The effectiveness of these digital ID systems lies in their ability to create transparent, verifiable, and secure mechanisms of interaction that fundamentally reshape the landscape of public service delivery and administrative accountability.

E-Procurement Platforms

Public procurement can be a significant source of corrupt practices due to systematic vulnerabilities and the often complex yet opaque nature of the process. Corrupt practices can occur at different stages of the public procurement lifecycle, appearing in routine transactions like office supplies purchases or public service access, where local officials misuse their authority. At a higher level, it can also involve grand corruption practices, with high-ranking officials engaging in major infrastructure projects or privatization deals, fundamentally distorting regulatory functions and having systemic consequences. It can also start during the early planning stages, with politicians manipulating policies and resource allocation. Complexity and discretionary power over the whole procurement cycle can facilitate corrupt practices.

Centralizing information on public procurement processes through the digitization of procurement processes enhances internal anti-corruption measures and facilitates the identification of integrity violations.[68] **E-procurement platforms** function as centralized information repositories for procurement documentation throughout the lifecycle while reducing face-to-face interactions between officials and bidders, decreasing opportunities for bribery and undue influence in contract awards.[69] These systems establish standardized procedures across procurement phases, particularly during tendering, ensuring all participants adhere to uniform rules and mitigating risks of favoritism and manipulation.[70] Additionally, the digital records maintained by e-procurement systems enhance transparency and accountability by enabling greater scrutiny of procurement activities (see Table 3.1.1.1).[71]

Table 3.1.1.1 E-procurement platform success stories

Chile – ChileCompra Procurement Observatory	**Enhancing Transparency and Accountability** *The Observatory's ability to systematically track and address irregularities has streamlined procurement oversight, making it a model for other sectors.* Despite having ChileCompra, a robust e-procurement system adopted in 2003, Chile faced challenges in completely eradicating corrupt practices within public procurement. To further bolster integrity, Chile integrated the ChileCompra Procurement Observatory into the existing online platform to monitor procurement processes, identify irregularities, and ensure compliance with public procurement laws.[72] In 2023 alone, the Observatory counted 637 irregular situations related to public procurement, facilitating timely interventions.[73]
Korea – KONEPs e-Procurement System	**Comprehensive and Scalable Approach to Digitalization and Security** *KONEPs has become a scalable solution that can evolve with emerging technologies, ensuring its long-term sustainability and effectiveness.* Korea's KONEPs, implemented in 2002, stands as one of the best examples of e-procurement systems worldwide. KONEPs digitalizes the entire procurement process, eliminating direct contact between suppliers and purchasers.[74] It also incorporates robust security measures, like biometric verification and digital encryption, and makes bid requirements publicly accessible. As a result, the integrity index score of Korea's Public Procurement Service improved by 27.2 percent during the initial three-year implementation period; 9 economies also adopted e-procurement systems based on KONEPs, highlighting its international success.[75] Almost 20 years later, a Next Generation KONEPs has been announced, which will leverage AI and Big Data for even more tailored procurement services.[76]
Mexico – CompraNet	**Evolving for Greater Transparency and Real-time Auditing** *The seamless integration of BESA into CompraNet demonstrates the effectiveness of evolving e-procurement systems to incorporate real-time auditing, setting a precedent for future enhancements.* Mexico's CompraNet system was developed in 1996 and has kept evolving. In 2023, CompraNet underwent a significant transformation through a technological upgrade developed by Mexican public servants of the federal government. In 2024, the system integrated the Electronic Procurement Monitoring Log (BESA), which enables real time auditing of over 80 percent of contracts within the Mexican Federal Public Administration, with the goal of eventually covering 100 percent of contracts. Another update made in 2024 was the incorporation of an electronic auction feature within the system. This tool allows prospective public procurement suppliers to participate in bidding processes and improve their initial financial offers, thus promoting greater competition and transparency. BESA also allows for continuous tracking of contract execution, monitoring, and payments, thereby enhancing the efficiency and integrity of procurement oversight.[77]

Source: Access Partnership research/analysis

Collectively, the ChileCompra Procurement Observatory, the KONEPs e-Procurement System, and Mexico's CompraNet offer invaluable lessons for APEC member economies looking to implement or enhance their e-procurement platforms. The following key takeaways highlight the critical strategies and best practices derived from these successful initiatives:

- Adopting advanced monitoring and auditing tools can significantly enhance the detection and prevention of corrupt practices in public procurement. These tools include data analytics, real-time auditing, and biometric verification capabilities.
- Governments should prioritize continuous improvement over achieving perfection in the first implementation. Regular updates and enhancements ensure that e-procurement systems remain effective and adaptable to emerging technological advancements and changing needs. Similarly, designing e-procurement platforms that can scale and incorporate new technologies guarantees long-term sustainability and responsiveness to evolving public sector requirements.
- Adopting and adapting successful models like KONEPs and ChileCompra allows economies to benefit from proven strategies while tailoring them to their unique public sector structures and needs.

As will be further explored in Section 4, emerging technologies are being integrated into current e-procurement solutions to better fight corruption. For instance, blockchain-based e-procurement platforms can hinder document manipulation by creating tamper-proof records. In the next generation of Korea's KONEPs,[78] AI/ML can enhance established e-procurement tools by automating assessments and optimizing processes improving e-procurement systems to prevent, and even predict, corrupt behaviors.

3.1.1.2. Established Technology 2: Information Management Systems

Open Data Platforms and Databases

Open data platforms and databases are systems used to centralize and disclose information. These platforms enable public oversight of government and organizational activities. Open data has been recognized as a significant tool for enhancing transparency and accountability in governmental systems. This is based on the belief that greater transparency allows increased public scrutiny, fostering more ethical and responsible behavior. By making data available and accessible, open data initiatives seek a more responsive and integrity-focused approach in the public sector, inherently deterring corruption and inefficiency.[79] While these initiatives can prevent corruption by creating a culture of accountability, they can also serve as a tool for the detection and investigation of corrupt practices by making information available, complementing other tools, as discussed below.

Best practices for implementing open data platforms center on ensuring data quality, accessibility, and usability (see relevant example under Table 3.1.1.2). Their effective implementation requires the disclosure of information in machine-readable formats to enable efficient data processing and analysis. Regular updates of datasets ensure the continued relevance and utility of the information, while comprehensive metadata provides essential context for understanding and interpreting the data effectively.

The success of open data initiatives depends heavily on institutional infrastructure and commitment. A strong institutional framework must underpin these platforms, supported by clear data governance policies that define roles, responsibilities, and procedures for data management. Furthermore, robust technical infrastructure is essential to maintain platform reliability and ensure continuous accessibility to users. This technical foundation must be

designed to accommodate growing data volumes while maintaining system performance and security, ultimately fostering sustained platform effectiveness and user engagement.

Table 3.1.1.2 TheIntegrityApp encourages insights on anti-corruption

Brazil and Paraguay – Integrity App (Alliance for Integrity)[80]	**Open Data Platform Empowers Public Officials to Share Insights on Anti-corruption** *Ensuring anonymity has encouraged more accurate and comprehensive reporting of corruption perceptions and knowledge gaps, enabling the development of tailored training programs that address the specific vulnerabilities and gaps in the public sector.* Brazil and Paraguay have taken significant strides in combating corruption by implementing "TheIntegrityApp", an open data platform developed with the support of the Alliance for Integrity.[81] This innovative tool empowers public officials to anonymously share insights on integrity perceptions and their awareness of anti-corruption tools. In both economies, implementing open data tools significantly enhanced the collection of honest feedback from public officials, providing a clearer picture of the climate of integrity and facilitating data-driven decision-making and training.

Source: Access Partnership research/analysis

Beneficial Ownership Registers

A Beneficial Owner (BO) is a natural person who ultimately owns or controls an asset, even if the legal title is in another name. In different jurisdictions, ultimate owners or controllers can remain masked. BO registries are databases that reveal the ultimate owners of companies, helping authorities track down individuals who use shell companies for illicit activities like money laundering and corruption. Digital systems and administrative processes need to work together to enable the collection, storage, exchange, and publication of BO information.[82]

By making this information available, BO registries deter the use of complex corporate structures to hide corrupt practices. Economies have implemented BO disclosure technologies with nuanced approaches to data accessibility, typically categorized into three primary access models:

1. **Restricted Access**, where information is exclusively available to law enforcement agencies.
2. **Limited Access**, extending beyond law enforcement to include users who can substantiate a legitimate investigative or professional interest.
3. **Public Access**, providing comprehensive transparency through open consultation and unrestricted public visibility.

As a technology-driven approach, BO registries are helpful tools for governments seeking to combat the use of opaque shell entities created to conceal proceeds from corruption and associated financial crimes like money laundering. By implementing technological infrastructure, governments can centralize information to help prevent corrupt practices and enhance the detection and investigation of illegal activities. Existing digital infrastructure and system tools (see Table 3.1.1.2) can be strategically utilized to collect and maintain BO data, with distributed ledger technology (DLT) offering transformative potential (further explored in Section 4). DLT can enable secure, transparent, and tamper-proof record-keeping,

potentially changing how BO information is collected, stored, and shared across institutional systems.

Table 3.1.1.2 Indonesia's Central Beneficial Ownership Registry

Indonesia – Central Beneficial Ownership Registry	**Accurate Ownership Data Leading to Enhanced Corporate Transparency** *Despite implementational challenges, the establishment of the registry represents a crucial step in Indonesia's commitment to enhancing corporate transparency and combating corruption.* Indonesia's central BO registry[83] requires corporations to submit and maintain up-to-date ownership information. The registry used to impose fees for accessing ownership data, but since 2022 access is free.[84] Furthermore, Indonesia is also looking at its potential use in criminal investigations, licensing processes, and public procurement decisions. Improved inter-agency collaboration and robust verification systems are essential for the registry's diverse usage.[85]

Source: Access Partnership research/analysis

Indonesia's experience highlights that establishing central registries requiring corporations to disclose beneficial ownership information is a correct step toward enhancing transparency and accountability. However, to ensure the registry's effectiveness, it is essential to:

- Implement complementary measures that guarantee accessibility and affordability for the public;
- Invest in robust data verification systems; and
- Foster inter-agency collaboration to maintain data accuracy and comprehensiveness.

Such a balanced approach will not only strengthen corporate transparency but also support broader anti-corruption efforts.

3.1.2. Detection

3.1.2.1. Established Technology 1: Web Technologies and Digital Services

Digital Whistleblowing Platforms

Digital whistleblowing platforms, including web portals and mobile applications, have arisen as useful tools in the global fight against corruption, complementing traditional channels such as hotlines and in-person reporting. These digital platforms offer accessibility, confidentiality and efficiency in corruption reporting and facilitate the detection and investigation of corrupt practices. By providing safe channels for reporting misconduct, these platforms empower individuals to disclose corrupt practices without fear of retaliation. This increased accessibility encourages more people to come forward, facilitating the detection and investigation of unethical and corrupt activities within organizations.

Effective whistleblowing platforms are characterized by several key features that enhance their functionality and encourage users to report misconduct. Anonymity and confidentiality are crucial, as they ensure that whistleblowers can submit reports without fear of information disclosure and retaliation. This feature is essential for fostering a safe environment where users feel empowered to speak up about unethical behavior (see Table 3.1.2.1). Additionally,

strong data security measures such as encryption and secure storage are critical to protect sensitive information and maintain the trust of users. The effectiveness of those mechanisms also relates to the need for timely responses and transparency on how complaints are handled and resolved.[86]

Table 3.1.2.1 Digital whistleblowing platform success stories

Singapore – eComplaint Portal	**Empowering Confidential Reporting** *By providing a safe and accessible means for reporting misconduct, Singapore's eComplaint has enhanced public engagement in anti-corruption initiatives. Its success lies in its user-centric design, robust whistleblower protection and extensive promotion of such features, encouraging more individuals to come forward.* Launched by the Corrupt Practices Investigation Bureau (CPIB), Singapore's Corruption Reporting Portal (eComplaint)[87] is a secure and user-friendly digital platform that allows citizens and public officials to confidentially report instances of corruption and misconduct.[88] The portal integrates robust security measures to protect whistleblower identities, and extensive public awareness campaigns were conducted to encourage use. According to the last CPIB report, in 2023 they received 215 corruption-related reports, of which 81 (38 percent) were registered as cases for investigation. Of the total number of cases, 98 (46 percent) were submitted anonymously.[89]
Malaysia – MACC Mobile Application and Complaints Management System	**Expanding Anti-corruption Channels** *Combining new digital tools with existing reporting channels ensures a comprehensive, efficient and relevant reporting system.* Malaysia's traditional reporting channels, such as hotlines and email, were limited in accessibility and reach. There was a need for more versatile and user-friendly platforms to encourage public participation and streamline the reporting process. As such, the Malaysian Anti-Corruption Commission (MACC) launched a mobile application and the MACC Complaints Management System to complement existing reporting channels.[90] These platforms enable citizens to report corruption incidents conveniently and securely.

Source: Access Partnership research/analysis

The implementations in Singapore and Malaysia reveal several critical insights that can guide APEC member economies in enhancing their detection and investigation mechanisms against corruption:

- Designing intuitive and easily accessible reporting tools, such as mobile applications and online portals, significantly increases user engagement and reporting rates.
- Combining multiple digital tools into a cohesive ecosystem enhances the effectiveness of corruption reporting and investigation processes by providing comprehensive coverage and streamlined workflows.
- Conducting extensive awareness campaigns and training programs is essential to educate the public and officials about the available reporting tools and ensure their proper and effective usage.

3.1.2.2. Established Technology 2: Information Management Systems

Case Management Systems

Technological advancements have significantly improved case information management. Electronic Case Management enables team members working remotely to collaborate effectively, facilitating easier pattern recognition and comprehensive information gathering.[91] This technological infrastructure proves particularly valuable in complex investigations that involve large-scale corruption or span multiple jurisdictions.

Electronic case management systems work as a central repository for intelligence data (see Table 3.1.2.2 for an example).[92] They can standardize core processes across all investigations and increase accountability and visibility, providing the ability to efficiently compile, organize, and analyze evidence. These systems strengthen the thoroughness and effectiveness of investigative processes while simultaneously improving the coordination capabilities of investigation teams working across different locations. Such increased ability, while starting in the Detection and Investigation stage, extends to the Sanction stage as the case progresses towards a conviction and/or asset recovery.

Table 3.1.2.2 UNODC goCASE system

UNODC – goCASE system[93]	**Enhancing Investigative Efficiency Through Integrated Case Management** *goCASE has revolutionized how investigative agencies handle complex cases by providing a robust framework for data management and workflow optimization.* goCASE is an advanced integrated case management system developed by the United Nations Office on Drugs and Crime (UNODC) Information Technology Service. Designed to address the critical information management challenges faced by law enforcement and investigative agencies, the system provides a comprehensive solution for processing, analyzing, and managing complex investigative data, including documents, individual profiles, events, and evidentiary exhibits. The platform is particularly effective in financial investigations where precise documentation of monetary transactions and evidence trails are essential for establishing criminal activity.

Source: Access Partnership research/analysis

3.1.2.3. Established Technology 3: Basic Analytics and Monitoring Software

Basic Forensics Tools

Digital Forensics generally uses different techniques to meet diverse purposes during the course of legal investigations of cases containing digital evidence. It can be used in the acquisition, preservation, analysis and presentation of evidence.[94] Acquisition would refer to the process of collecting electronic data; for instance, in a corruption case taking custody of a public officer's computer to collect digital evidence, using tools to copy hard-disks and electronic data that can constitute evidence.

Preservation refers to creating chain custody for digital evidence, starting before collection and ending with the evidence either destroyed or released to the owner. It is essential to prevent alteration and preserve the integrity of digital evidence. Analysis constitutes the actual process of identifying and extracting specific evidentiary items from previously collected evidence. It

involves finding target information. The presentation refers to the actual presentation of evidence, which includes forensics reports, the creation of affidavits, and court testimony.[95]

Basic forensic tools are specialized software applications designed for the systematic acquisition, display, and interpretation of digital evidence during investigative processes.[96] These tools allow investigators to trace digital evidence through complex networks by analyzing digital records, metadata, and patterns. It can be used to trace financial transactions, digital communications, and different types of digital evidence. Forensic tools can often recover deleted messages and metadata in communications; for instance, helping to identify possible networks of corruption. Some of these tools can reveal document tampering, including backdating and alterations, helping investigators expose falsified records that frequently accompany corrupt activities (see Table 3.1.2.3).

Bulk extractor software, for instance, serves as an electronic evidence extraction tool that uses basic data analysis to examine large amounts of data, evolving from a manual method of extracting and analyzing individual files.[97] It is instrumental in cases that involve multiple pieces of digital evidence, such as public corruption cases, as bulk data analysis can identify which hard drives or cell phones contain email addresses of interest and generate new leads for further investigation on corruption networks.[98]

Table 3.1.2.3 EnCase supports forensic investigations

	Forensic Investigations Supported by Advanced Digital Tools
Authorities in the United States; Colombia; and Netherlands – EnCase Suite	*EnCase has not only facilitated comprehensive and speedy digital investigations, but it has also expanded the geographical reach of investigations by supporting data analysis in local languages.* EnCase (former Guidance Software Corporation, acquired by OpenText in 2017) is a suite of digital investigation products and tools for data collection, analysis, and reporting. It enables forensic professionals to acquire data from various sources, including computers, mobile devices, and cloud environments, ensuring that the evidence is collected in a forensically sound manner. The software allows users to analyze digital evidence efficiently, uncovering hidden files and artefacts that may be critical for investigations in corruption cases.[99]

Source: Access Partnership research/analysis

Anomaly Detection and Rule-Based Methods

Anomaly detection and rule-based methods have been critical tools in combating fraud, corruption, and abuse for over two decades[100] to identify anomalies in financial data; for instance, the use of such tools to detect anomalies with human oversight to identify unusual behavior in transactions. They use narrow or basic analytics to perform rule-based analysis, integrating technology and human expertise to detect improper transactions like fraud and bribery both before and after they occur.[101] They serve as a preventive and detective measure in the fight against corruption, particularly in fraud and other financial crime detection. By gathering, storing, and mining data for patterns, discrepancies, and anomalies, particularly in financial data, organizations can translate these insights into proactive threat management strategies and develop a robust corruption detection environment.

With the advancement of Data Analytics and AI/ML, these traditional methods are undergoing a transformative evolution. While rule-based and anomaly detection techniques have provided a foundational framework for identifying unusual patterns, the use of AI/ML is now augmenting these approaches with more sophisticated, adaptive, and intelligent detection capabilities[102] (see Section 4 for more on AI/ML).

3.1.3. Sanction

3.1.3.1. Established Technology 2: Information Management Systems

Asset Tracking and Recovery Systems

Asset recovery represents a critical mechanism in combating financial corruption, defined as the systematic process of tracing, freezing, and returning illegally acquired assets to their original jurisdictional source.[103] Asset tracking and recovery systems can be implemented to monitor and manage all assets subject to provisional measures and confiscation including corrupt assets (see Table 3.1.3.1). This requires close collaboration between financial institutions, law enforcement agencies, and judicial systems.

The operational infrastructure of asset tracking systems relies primarily on established technologies, such as database management and secure information sharing. These systems enable financial investigators and legal authorities to systematically monitor asset movements, identify potential irregularities, and develop actionable intelligence about potentially corrupt financial transactions and recovery mechanisms. Asset tracking systems can also play an important role, particularly in the context of asset forfeiture and recovery facilitating tracing and retrieval of assets obtained through corrupt practices.

Table 3.1.3.1 Asset tracking and recovery system success stories

The United States – CATS	**Streamlining Asset Forfeiture Across Agencies** *CATS streamlines workflow by integrating email and document generation software, allowing better coordination among participating agencies to easily access and track asset processing details through multiple query screens. This makes the asset recovery process more effective and accountable, especially when involving multiple stakeholders and jurisdictions.* In 1990, the United States developed an integrated asset forfeiture system named the Consolidated Asset Tracking System (CATS).[104] CATS, an internal US law enforcement system, is a centralized database system that supports administrative and judicial cases on asset forfeiture across multiple agencies, ensures proper asset management, and facilitates enhanced interagency asset recovery coordination by replacing outdated legacy systems with a standardized and integrated approach to asset tracking. Each asset subject to asset recovery proceedings is given a unique identifier which enables effective, transparent cross-agency monitoring of an asset's entire lifecycle from seizure to disposal.
Thailand – AMCATS	**Strengthening Anti-money Laundering Efforts with Global Technical Assistance** *The development of AMCATS highlights the value of international technical assistance in developing robust asset-tracking systems. Its comprehensive data management capabilities significantly improved AMLO's ability to monitor and recover assets linked to money laundering and corruption.*

From 2001 to 2006, United States government agencies provided technical assistance to Thailand's Anti-Money Laundering Office (AMLO). This support included computer hardware and software for AMLO's asset tracking system, known as AMCATS (AMLO Consolidated Asset Tracking System).[105] AMCATS maintains comprehensive records of seized assets, tracking key information such as the asset's name, value, name of the related case, seizure order, storage location, income generated, and maintenance expenses.

Source: Access Partnership research/analysis

To build effective asset tracking and recovery systems, the implementations of CATS in the US and AMCATS in Thailand offer the following insights:

- Centralized asset tracking systems unify data management across multiple agencies, enhancing both efficiency and accuracy. These efforts should be complemented by standardizing data entry and asset management processes, which reduce inconsistencies and improve the reliability of tracking systems.
- Detailed and comprehensive records are essential for effective asset tracking, supporting thorough investigations and accountability. Asset tracking systems should be able to capture all relevant information, including financial details, case-related data, and asset lifecycle events. Detailed and comprehensive records are essential for effective asset tracking, supporting thorough investigations and accountability.
- International collaboration and technical assistance can significantly enhance the development and implementation of robust asset-tracking systems. Governments may seek partnerships with international organizations and economies to gain access to technical expertise and resources for developing effective asset-tracking solutions.

Box 3.1.3.1 Expert Insight: Brook Horowitz

EXPERT INSIGHT: Brook Horowitz

CEO of IBLF Global

"Most current anti-corruption technology efforts focus on preventive measures like due diligence and data analysis. However, there's a significant gap in using technology for law enforcement and investigative purposes. Public-private partnerships could bridge this gap but require genuine collaboration and support in order to build capacity in the public sector."

3.2. LIMITATIONS OF ESTABLISHED TECHNOLOGIES

While established anti-corruption technologies have proven their value, they face important limitations that constrain their effectiveness:

- **Data integration and quality:** Most existing systems operate in silos, making it difficult to identify complex corruption patterns that span multiple agencies or jurisdictions. Manual data entry and inconsistent standards create quality issues that undermine analysis, while the lack of standardization across borders hinders

international investigations. Moreover, traditional systems struggle to process unstructured data like emails, documents, and social media posts, where important corruption signals may lie hidden.

This limitation was illustrated in the 1Malaysia Development Berhad (1MDB) case, where corrupt activities spanned multiple economies, including Malaysia; Australia; the United States; Singapore; Switzerland; and the UK.[106] This geographical dispersion necessitated seamless data sharing and integration among diverse regulatory bodies, which was often hindered by disparate data standards and incompatible systems. Fragmented data landscapes impeded international investigations involving numerous global financial institutions, each with their own data management protocols. The absence of a unified data integration framework meant that vital information was often siloed within individual organizations, delaying the identification of suspicious transactions and the coordination of regulatory responses.

- Furthermore, the 1MDB case exposed the critical need for robust data quality controls. Inadequate customer due diligence and transaction monitoring processes, compounded by poor record-keeping practices, resulted in an inaccurate assessment of risk and inadequate tracking of financial flows.

- **System rigidity:** Traditional anti-corruption technologies typically rely on fixed rules and thresholds that corrupt actors can learn to circumvent over time. These systems often struggle to adapt to new corruption schemes and tactics, limiting their effectiveness against evolving threats. Their rigid architecture also makes it difficult to quickly modify systems in response to new regulatory requirements or emerging risks.

  The Siemens bribery scandal in 2008 lends a valuable lesson in this aspect. For years, the company circumvented existing detection systems by employing sophisticated methods to disguise bribes as legitimate payments.[107] Siemens' internal anti-corruption system controls were rigid and rule-based, which proved insufficient in identifying and adapting to the sophisticated and evolving schemes the company employed to conceal bribery, such as cash desks and slush funds. The inability of these rigid systems to detect nuanced and cleverly disguised corrupt transactions highlighted their limitations.

- **Resource intensity:** Perhaps most critically, established technologies remain highly resource intensive. They rely heavily on manual review and investigation processes, creating significant time lags between detection and response. High false positive rates consume valuable investigative resources, while substantial ongoing training and maintenance requirements strain organizational capacity.

  In a survey by ACTWG, 75 percent of respondents viewed the enhancement of digital skills and literacy of anti-corruption practitioners as crucial, while 70 percent emphasized the need for expanding digital infrastructure to overcome limitations in implementing digital innovation and anti-corruption technologies.[108] However, this lack of adequate digital skills and infrastructure in and of itself can create new opportunities for corruption, even as digitalization increases transparency, by making it challenging to effectively implement resource-intensive technologies.

These limitations point to clear opportunities for emerging technologies, particularly in areas such as automated pattern detection, real-time monitoring, and predictive analytics, to help address these challenges. The following section will examine some of these new technologies that offer promising solutions to persistent challenges in anti-corruption while raising important considerations about implementation and integration with existing systems.

4. FRONTIERS OF TECHNOLOGY FOR ANTI-CORRUPTION

This chapter explores the emerging and innovative technologies that are currently available to combat corruption. Over the past decades, rapid advancements in areas like AI/ML, data analytics, and digital ledger technology (DLT) have created powerful tools that can be leveraged to better prevent, detect, and sanction corrupt activities.

The key technologies to be examined in this chapter include:

- Artificial Intelligence or **AI** is the ability of a computer or a computer-enabled robotic system to process information and produce outcomes in a manner similar to the thought process of humans in learning, decision-making, and problem-solving.[109] AI, together with Machine Learning – or **ML**, a set of techniques that allow machines to learn in an automated manner through patterns and inferences[110] – are increasingly powerful tools in fighting corruption, leveraging their ability to analyze complex datasets and identify suspicious patterns that might indicate fraudulent activities. Moreover, AI/ML serves as a foundational technology for emerging applications like facial recognition and natural language processing while simultaneously enhancing other technologies, such as data analytics, blockchain, and cybersecurity tools and initiatives. As these technologies continue to evolve, the lines between AI/ML and other emerging technologies become increasingly blurred, presenting unprecedented opportunities for detecting, preventing, and mitigating corruption through advanced computational techniques that can process and interpret data far beyond traditional human capabilities.

  Advanced Data Analytics refers to the autonomous or semi-autonomous analysis of complex data sets using advanced statistical methods, predictive modelling, ML algorithms, and other cutting-edge techniques to extract deeper insights and make more accurate predictions. It goes beyond traditional descriptive analytics to provide predictive and prescriptive insights. An example is the use of quantum technology and quantum machine learning (QML) algorithms which can analyze large transaction datasets to swiftly identify anomalies indicative of corrupt practices or fraudulent activities. These algorithms leverage quantum computing's ability to process vast amounts of data simultaneously, enabling faster detection of irregular transactions and hidden connections between entities involved in corruption networks.[111]

  As technology advances, data analytics continues to evolve, increasingly incorporating emerging technologies like AI/ML and blockchain to enhance their capabilities in processing and interpreting complex datasets. Its potential for drawing insights and supporting decision-making can be used to flag potential corrupt practices, trace irregular transactions, and provide actionable insights for prevention and investigation, thus creating a more transparent and accountable system.[112] Outlined below in Table 4 is a brief comparison of data analytics and data mining, as their differences are often misunderstood.

Table 4 Data analytics vs. data mining

Data Analytics[113]	Data Mining
• Examine datasets to draw conclusions and support decision-making, typically starting with a specific hypothesis. • Primarily deals with structured data and uses statistical methods.	• Discovers hidden patterns within large datasets using algorithmic techniques without a predetermined hypothesis. • Can handle both structured and unstructured data through more complex, AI/ML-driven processes – it is essentially a specialized step within the broader field of data analytics.

Source: Access Partnership research/analysis

- **Blockchain** is a decentralized DLT that records transactions across a network of computers, ensuring transparency, security, and immutability. Each block contains a hash of the previous block, a timestamp, and transaction data, making it difficult to alter records.[114] Due to its high level of security and immutability, the technology has been presented as a breakthrough for combating fraud and ensuring the protection of data and assets; in particular, in the financial sector, where blockchain has had its biggest impact. Nevertheless, beyond the financial market, blockchain uses and solutions are still being tested. [115] Its potential to drive impact on the way we record assets, transfer value, and track transactions in a decentralized manner, ensuring the transparency, integrity, and traceability of data without a central authority to authenticate the information, should continue to be explored for anti-corruption.
- **Facial Recognition** techniques can help identify suspicious individuals and surface hidden connections. Facial recognition uses software to determine the similarity between two facial images. Although the technology is used for a variety of purposes (like banking operations, log-in options and security checks), there is an increasing interest from investigators and police officers in maximizing the benefits that this technology presents for anti-corruption purposes. A key aspect of facial recognition techniques is the utilization of computer-generated filters to transform face images into numerical expressions that can be compared to determine their similarity. These filters are usually generated by using deep "learning," which uses artificial neural networks to process data. [116]
- **Drones and Remote Sensing** technologies are advanced tools used for gathering data and imagery from a distance, typically without direct physical contact. Drones, also referred to as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UAS), are aircraft that operate without a human pilot on board. These versatile machines can be controlled remotely or fly autonomously using pre-programmed flight plans and onboard sensors.[117] Remote sensing technologies encompass a broader range of tools and techniques used to gather information about an object or area from a distance, typically without direct physical contact. These technologies often work in tandem with drones but can also be deployed on satellites, aircraft, or ground-based platforms. [118] These can be powerful tools in fighting corruption by providing real-time, high-resolution monitoring to foster unprecedented transparency and documentation of

infrastructure projects, land use, and resource extraction, allowing independent verification of governmental and corporate claims about development, construction, and environmental management.

As outlined above, several emerging technologies are being explored for anti-corruption purposes. Figure 4 demonstrates the numerous advantages offered by these technologies, when used correctly.

Figure 4 Advantages of emerging technologies

Speed and Efficiency

AI and advanced analytics can process massive amounts of data quickly, identifying patterns and anomalies that might be missed by manual analysis.[119]

Proactive and Predictive Capabilities

These technologies can predict potential risks and identify vulnerabilities before corruption occurs, enabling proactive prevention measures.[120]

Enhanced Traceability and Transparency

Blockchain technology enhances traceability and transparency in financial transactions, making it more difficult to conceal corrupt activities.[121]

Source: Access Partnership research/analysis

Real-world case studies are also presented below to demonstrate how these innovative technologies are being deployed to curb corruption around the world. By embracing these cutting-edge tools and approaches, governments, businesses, and civil society can be empowered to more effectively combat this persistent global challenge.

4.1. MAPPING OF EMERGING TECHNOLOGIES AGAINST THE ANTI-CORRUPTION VALUE CHAIN

Table 4.1 below presents an overview of the various emerging technologies currently explored in the context of the three stages of the anti-corruption value chain.

Table 4.1 Emerging technologies and their uses across the three value chain stages

	 Prevention	 Detection	 Sanction
AI/ML and Advanced Data Analytics	• Enhanced Anti-corruption Training Programs • Risk Monitoring and Prevention	• Pattern Detection and Anomaly Identification • Document Review and Evidence Gathering • Public Engagement and Transparency	• Asset Tracking • Recovery Process Optimization • Sanction Process Optimization

	 **Prevention**	 **Detection**	 **Sanction**
	• Regulatory Compliance Monitoring • Predictive analytics • Improve training courses[122]	• Due Diligence • Investigation Support Tools • Forensic tools • Advanced Data Analytics Apps	
Blockchain	• Technology-supported supply chain monitoring • Secure Identity Management • Automated Auditing • Smart Contracts	• Blockchain analytics tools • Improve data sharing • Enhancing Whistleblower Protections	• Blockchain-based asset registries
Facial Recognition	• Monitoring Access • Ghost Employee Detection • Bid Rigging Prevention • Travel Monitoring	• Network Mapping • Asset Tracing • Evidence Verification • Pattern Detection	
Drones and Remote Sensing	• Document environmental compliance • Tracking and monitoring compliance with zoning regulations	• Detecting unauthorized or illegal activities • Verifying property tax assessments • Documenting informal settlements	

Source: Access Partnership research/analysis

The following sub-section analyses the emerging technologies mapped in the table above, digging into the diverse applications of these technologies. It highlights their potential to revolutionize the detection of corruption, improve the outcomes, and enhance the use of resources and tools available today. The section aims to illustrate current but also future uses of these technologies.

4.1.1. Prevention

4.1.1.1. Emerging Technology 1: AI/ML and Advanced Data Analytics

AI/ML and Advanced Data Analytics represent a powerful technological convergence that is revolutionizing the fight against corruption. These interconnected technologies work synergistically to transform how organizations detect, prevent, and mitigate fraudulent

activities, offering unprecedented capabilities in processing, analyzing, and interpreting complex data landscapes.

Risk Monitoring and Prevention

By analyzing vast amounts of historical and real-time data, these advanced technologies can detect subtle patterns and anomalies that might indicate potential corrupt activities, creating a sophisticated early warning system for organizations and government agencies.

In public procurement processes, AI/ML-driven continuous monitoring provides an unprecedented level of transparency and oversight (see Table 4.1.1.1). The automated risk scoring of vendors and contractors is particularly powerful, transforming how organizations assess potential business partners. AI/ML models can create comprehensive risk profiles by integrating diverse data sources, including:

- Historical performance records
- Financial stability indicators
- Legal compliance history
- Network analysis of business relationships
- Geopolitical and regional corruption indices

These intelligent scoring systems go beyond traditional background checks, using sophisticated algorithms to generate dynamic risk assessments that continuously update based on new information. A vendor's risk score can change in real-time as new data becomes available, providing organizations with a living and "breathing" evaluation of potential corruption risks. Real-time disclosure of public spending data becomes dramatically more effective with AI/ML technologies. These systems can instantly publish and contextualize financial information, tracking government expenditures across different departments and projects. By providing immediate, comprehensive insights into financial flows, such platforms create unprecedented levels of transparency, making it significantly more difficult for officials to misappropriate funds unnoticed.

Table 4.1.1.1 AI monitoring integration success stories

Brazil: Alice AI bot[123]	**Automating Anti-Corruption in Public Procurement** *The integration of AI-driven tools like Alice demonstrates the potential of automated systems in enhancing anti-corruption efforts. Its ability to process large datasets and identify anomalies in real time significantly improves the efficiency and effectiveness of public procurement oversight.* Due to the corruption risks involved in the public procurement processes in the economy, the Office of the Comptroller General (CGU) created the Bidding, Contracts, and Tenders Analyzer (Analisador de Licitações, Contratos e Editais – "*Alice*") with the objective of acting in a preventive and timely manner in relation to public procurement.[124] Utilizing data mining and AI/ML, Alice collects information about ongoing procurement activities from the primary federal government procurement platforms. This automated data gathering allows for real-time monitoring of procurement processes across various government agencies. A key strength of Alice lies in its ability to compare data and transactions from multiple sources. This cross-referencing capability allows the system to

	evaluate potential risks of control failures that may exist between different systems, providing a more comprehensive view of procurement activities.[125] These alerts are directed to human auditors for further investigation and decision-making, ensuring that automated findings are contextualized and acted upon appropriately. Alice has helped suspend over BRL 9.7 billion (USD 1.6 billion) in potentially problematic government purchases based on its alerts just from CGU's actions alone.[126] It has enabled CGU to take preventive and timely action regarding public procurement, adding value to public management and it has allowed CGU to maintain effectiveness in monitoring despite a 28 percent reduction in workforce between 2012-2022.[127]
Thailand – AppAI (Anti-Corruption AI)[128]	**Achieving Comprehensive Data Integration for AI Analysis of Procurement Data** *The eventual successful implementation of "ACT Ai" underscores the importance of addressing data accessibility and standardization issues by digitizing records and implementing uniform data management practices across all relevant agencies, supported by concerted efforts in cross-stakeholder collaboration.* At the center of Thailand's technological efforts to combat corruption is ACT Ai (Anti-Corruption Thailand AI),[129] a web-based application that links procurement data with company registration information and declarations of politically exposed persons (PEPs) to detect potential fraud and corruption indicators. ACT Ai makes procurement data easily searchable and uses rule-based AI to detect potential corruption indicators, such as winning bids marginally below reference prices or projects with suspiciously few bidders.[130] However, implementing these technological solutions faced significant challenges. While data was technically public, accessibility remained a major hurdle. Information is often unstandardized, non-digital, and scattered across more than 20 different agencies. Currently, from the three data sources, ACT Ai contains over 30 million datasets, but this is still far from being a big data platform. According to the Open Data Charter, it needs data from over 30 sources for precise corruption detection, highlighting the scale of data needed for effective analysis. On top of this initiative, the Corruption Deterrence Center (CDC) which operates under the Anti-Corruption Commission of Thailand was established with the mandate to monitor and evaluate the corruption landscape, establish an analytical and evaluative system for corruption risks, and integrate data from all sectors to systematically help suppress and rectify corruption issues. Although the CDC was not established to support the ACT Ai initiative, it is another instance of the economy's efforts to combat corruption through enhancing technology. For example, the CDC's online public sentiment monitoring focuses on tracking signs of corruption on social media.[131] Various organizations, including the public, civil society organizations (CSOs), and investigative journalists, have been using the platform to identify potential corruption cases. The initiative has expanded beyond its original scope through partnerships with whistleblower platforms and crowdsourcing initiatives like the MustShare and Watchdog Facebook pages, which help gather local information.[132]

Source: Access Partnership research/analysis

The predictive capabilities extend beyond simple risk identification. AI/ML can also help organizations understand the probability and potential impact of corruption risks, allowing for more strategic preventative measures. By identifying systemic vulnerabilities and potential weak points in organizational processes, these technologies enable proactive risk management,

rather than reactive investigation. Moreover, these AI-driven monitoring systems can learn and adapt over time, becoming increasingly sophisticated in detecting complex, evolving corruption strategies. The ML models can incorporate feedback from actual investigations, continuously refining their risk detection algorithms and staying ahead of increasingly sophisticated corrupt practices.

The ultimate advantage of AI/ML in risk monitoring is their ability to process and analyze information at a scale and speed impossible for human analysts. They can simultaneously monitor thousands of transactions, contracts, and interactions, providing a level of comprehensive oversight that was previously unimaginable. This technological approach transforms corruption prevention from a reactive, resource-intensive process to a proactive, intelligent system of continuous risk management.

Regulatory Compliance Monitoring

Compliance monitoring is one of the most relevant aspects to prevent corruption. Although these programs have been constantly updated in the last years, AI/ML can provide further support by creating sophisticated, intelligent systems that can comprehensively track and analyze an organization's adherence to anti-corruption regulations.

The real-time monitoring capabilities of these AI/ML systems provide unprecedented oversight of policy adherence. ML algorithms can instantaneously analyze transactions, communications, financial records, and operational processes, cross-referencing them against an extensive database of regulatory requirements. This continuous monitoring allows for immediate detection of potential deviations, creating a dynamic compliance environment that can respond to risks as they emerge, rather than discovering violations through retrospective audits.

Box 4.1.1.1 Expert Insight: Barbara Tsai

EXPERT INSIGHT: Barbara Tsai, Asia Head of Compliance, Microsoft

Challenges of embedding AI in daily work can be overcome through targeted ML training, education, trust-building, and demonstrating how AI complements rather than replaces human expertise.

Microsoft's proactive approach focuses on leveraging AI for risk detection and policy guidance, significantly enhancing its ability to identify and mitigate corruption risks across global

- **AI-driven risk detection**: Microsoft developed advanced AI systems that analyze risk signals across various business activities, including sales patterns and economy-specific corruption indicators. These systems process a range of internal and external variables, which make up the identified risk signals and controls, to arrive at a risk scoring that is relevant for risk detection to support compliance decisions.
- **AI-powered compliance assistant**: Beyond traditional chatbots, Microsoft's compliance assistant offers immediate, policy-based guidance to employees. This tool not only assists in real-time decision-making but also allows compliance professionals to focus on more strategic tasks, thereby increasing overall operational efficiency.

And yet, there are several key challenges to the full implementation of AI.

- **Job role and purpose implications:** As with any major disruption to established norms, AI has led to questions of human autonomy and role in the workplace. The legal profession is heavily dependent on skills related to information reasoning and decision making, both key aspects of AI's value proposition. Whilst there is some element of fear that roles become obsolete, our focus should be on demonstrating and uplifting the value of AI as an accelerator and amplifier of the human expertise and skill. In the same way that voice recorders enabled lawyers to 'remember' conversations with clients, AI will be the tool that enables them to provide more precise and insightful legal advice.
- **Trust and reliability**: Concerns about the accuracy of AI outputs, potential algorithmic biases, and data privacy are growing, especially within the public sector where there is greater caution about adopting new technologies. Microsoft has been partnering with the public sector to support education and training efforts, to raise awareness about Responsible AI and the embedded security and safety features in their products.

To overcome these challenges, Microsoft's approach includes using closed systems trained on specific policies, maintaining clear links to source documents, and preserving human oversight.

Early warning systems represent a critical advancement in preventing regulatory violations. These systems go beyond simple rule-checking, using sophisticated pattern recognition to detect subtle indicators of potential misconduct. For instance, AI/ML algorithms can recognize

unusual transaction patterns, communication sequences, or behavioral indicators that might suggest emerging compliance risks, allowing organizations to take pre-emptive action.

Integration with existing compliance frameworks is particularly powerful, as AI/ML can work seamlessly across multiple systems and data sources. ML models can consolidate information from various organizational databases, external regulatory sources, and real-time data streams to create a comprehensive compliance monitoring ecosystem. The technology can also provide detailed, nuanced reporting that goes beyond simple compliance checks. ML algorithms can generate comprehensive risk assessments, highlighting potential vulnerabilities, suggesting improvements to existing compliance processes, and providing actionable insights that help organizations develop more robust anti-corruption strategies.

Enhanced Anti-Corruption Training Programs

AI/ML revolutionizes anti-corruption training by creating dynamic, intelligent, and personalized learning experiences that go beyond traditional static training methods. Interactive Q&A exercises powered by AI/ML can adapt in real-time to learners' responses, presenting increasingly complex ethical scenarios that challenge and assess an individual's understanding of potential corruption risks. These intelligent systems can generate simulation scenarios that mirror real-world corruption dilemmas, allowing employees to navigate nuanced ethical challenges in a safe, controlled environment.

The personalization aspect is particularly powerful. ML algorithms can analyze individual learner performance, identifying specific knowledge gaps, cognitive patterns, and areas of potential ethical vulnerability. This enables the creation of tailored learning paths that address each employee's unique needs, role-specific risks, and learning style. For instance, a procurement officer might receive more detailed training on contract manipulation risks, while a financial analyst would get scenarios focused on financial fraud detection.

To further improve training, automated assessment can further enhance evaluation to a new level. AI/ML algorithms can comprehensively analyze not just the correctness of responses, but the reasoning behind them, the consistency of ethical decision-making, and the depth of understanding. This goes beyond traditional multiple-choice tests, creating a more holistic assessment of an individual's ethical comprehension and potential corruption risks. Another way of using AI in the prevention phase is through virtual AI assistants, which can provide an additional layer of support, offering immediate, confidential guidance on ethical dilemmas to users. These assistants can draw from comprehensive databases of ethical guidelines, case studies, and organizational or economy-level policies to provide nuanced, context-specific advice.

By leveraging AI/ML, anti-corruption training transforms from a compliance checkbox to an intelligent, adaptive system that continuously learns, improves, and personalizes the approach to preventing unethical behavior. The result is a more engaged, aware, and ethically robust workforce equipped to recognize and resist potential corruption at every level.

Box 4.1.1.1 Expert Insight: Mark Lovatt

EXPERT INSIGHT: Mark Lovatt, CEO, Trident Integrity

AI can deliver more personalized and organization-specific anti-corruption trainings. "Strategic adoption of AI-based solutions, alongside traditional anti-corruption tools, can significantly enhance the effectiveness and adaptability of training programs, thereby strengthening overall integrity and compliance efforts.

The landscape of technologies used for anti-corruption purposes is rapidly evolving, with AI emerging as a game-changing tool alongside data analytics and blockchain.

AI represents a significant advancement by offering adaptive learning capabilities. An interesting example is a new AI-powered training system based on large language models (LLMs) to conduct better policy-focused anti-corruption/bribery training. This tool allows users to input their organization's policy (e.g., gift policy) and creates tailor-made interactive scenarios to test the knowledge, values, and understanding of employees. The tool generates a gaming environment with multiple scenarios based on the company policy, with an AI-created opponent which they have to beat. Users then participate in the game, which automatically gauges their level of understanding and identifies those providing the best response based on their interaction with the game. The same tool can be used for recruitment and promotion to assess the people most suitable for the job and pre-train them ready for their role. The platform can be found here: https://app.polynize.io/#/launch.

With an AI platform like this, the approach to anti-corruption training can be fundamentally transformed. Instead of relying on static presentations or generic scenarios, the adaptive nature of AI allows for personalized and engaging learning experiences. This continuous assessment and reinforcement ensure that employees have a deep and practical understanding of policies and procedures.

The technology can also track organizational trends, identifying potential systemic risks by analyzing aggregated training data. This means the training program itself becomes a proactive tool for understanding and mitigating corruption risks, providing insights into areas where additional focus or organizational intervention might be necessary.

Ultimately, different technologies serve different purposes. Agencies should start by implementing focused AI applications in high-risk areas while simultaneously building capacity for broader implementation.

4.1.1.2. Emerging Technology 2: Blockchain

Technology-Supported Supply Chain Monitoring

Blockchain technology is particularly well-suited for improving supply chain management due to its ability to enhance transparency and traceability. By providing all participants in a supply chain with real-time access to data, blockchain can prevent corruption by identifying discrepancies and irregularities that could indicate corrupt practices.[133] This technological approach eliminates traditional opportunities for corruption by creating a permanent, auditable trail that exposes discrepancies, unauthorized modifications, or suspicious transactions instantly.

Smart Contracts

Smart contracts on blockchain platforms transform auditing from a manual, potentially corruptible process to an automated, transparent system of verification and execution (see Table 4.1.1.2). These self-executing contracts with predefined rules can automatically trigger actions, release payments, or halt processes based on verifiable conditions, removing human discretion that might enable corrupt practices. Government processes become inherently transparent, with every step recorded immutably and executed precisely according to predetermined, unalterable rules.[134]

Table 4.1.1.2 Blockchain land registry enhances transparency

Rwanda – Ubutaka Blockchain-Based Solutions for Land Registry Systems[135]	**Blockchain-Powered Land Registry Enhances Transparency** *By eliminating paper-based fraud and enabling real-time auditing through mutable title systems on blockchain, Rwanda is setting a benchmark for other economies to follow in their anti-corruption efforts.* Ubutaka is a blockchain-based land transaction system designed to digitize and secure land transfers. By leveraging blockchain's immutable ledger, Ubutaka ensures that all land transactions are recorded transparently and securely. In economies where transactions are mostly conducted in cash (such as the purchase of land or houses), the implementation of this system could help reduce the risks of hidden bribery or money laundering, as it would ensure that digital proofs of all transaction data, authorization by the notary, and approval by the registrar are published to a public blockchain for future auditing and irrefutable proof of transfer.[136] Other economies, such as Sweden[137] and Georgia,[138] have also followed a similar approach.

Source: Access Partnership research/analysis

Secure Identity Management

Blockchain-based digital identity systems represent a paradigm shift in preventing identity-related corruption by creating tamper-proof, cryptographically secured digital identities. These systems eliminate the possibility of impersonation or false credentials by providing a decentralized, verifiable method of authentication that cannot be manipulated by individual actors. Each identity is cryptographically linked to verified credentials, making it exponentially more difficult for corrupt individuals to hide their true identity or create false personas for fraudulent activities.

Blockchain has also been tested to create tamper-proof company registries, making it a potentially powerful tool to ascertain a company's beneficial owners. These blockchain-based company registries can improve the "know-your-customer" solutions to better comply with current regulations by providing reliable information on the ultimate beneficial ownership of companies. Although several initiatives have been trialed since 2015, such as the Delaware initiative to enable corporations to utilize blockchain for the registration and transfer of ownership of stock, [139] the success of these applications has not been proven.

Furthermore, there seems to be an unexpectedly slow take-up of this technology. There seem to be several reasons why blockchain is not progressing faster. According to experts and practitioners interviewed as part of this study, the lack of clarity of accessibility to these technologies has discouraged many stakeholders. Mark Lovatt, CEO of Trident Integrity,

Vanessa Hans from the Basel Institute on Governance, and Carolina Echevarria of the Alliance for Integrity collectively argue that blockchain technologies are not yet widely embraced and continue to face challenges in gaining acceptance due to their complexity, high implementation costs, and a substantial knowledge gap. Technology is perceived as technically challenging, expensive to deploy, and lacking the necessary expertise for effective implementation, especially within public sector organizations. Despite initial enthusiasm, blockchain's development has stalled, with experts noting that while the private sector shows more technological adaptability, government entities struggle to understand and effectively integrate these technologies, creating a significant barrier to widespread adoption in anti-corruption efforts.

4.1.1.3. Emerging Technology 3: Facial Recognition

Facial recognition technology represents a very innovative and powerful tool with increasingly sophisticated applications in government oversight and security. By leveraging advanced AI and ML algorithms, this technology enables unprecedented capabilities in monitoring, verification, and detection across multiple domains. The following sections explore how facial recognition can be strategically deployed to enhance governmental transparency, prevent fraud, and maintain security protocols in various critical contexts.

Monitoring Access
Facial recognition technology offers a sophisticated method for preventing unauthorized interactions in sensitive governmental spaces. By implementing advanced camera systems in restricted areas, agencies can automatically detect and log instances where government officials meet with private sector representatives in locations where such meetings are prohibited. The system can create real-time alerts when unauthorized individuals are detected together, potentially capturing improper interactions that might involve bribery, insider trading, or other corrupt practices. For example, a facial recognition system could identify when a procurement officer meets with a vendor in a private location outside of official channels, immediately flagging this potentially suspicious encounter for further investigation.

Ghost Employee Detection
The technology also proves remarkably effective in addressing the persistent problem of ghost employees. By integrating facial recognition with workforce management systems, authorities can verify the actual existence and presence of government employees. This approach allows for detailed verification of payroll records, quickly exposing discrepancies such as fictitious employees, individuals falsely claiming to work in specific positions, or elaborate schemes involving multiple fake identities. The system can cross-reference physical presence with official documentation, providing concrete evidence of potential payroll fraud.

Bid Rigging Prevention
Bid rigging prevention represents another critical application. Facial recognition can track and analyze individuals present at different companies' bid submissions, revealing suspicious interaction patterns that might indicate collusion. The technology can detect when the same individuals appear at multiple supposedly competing firms' bidding events, helping procurement oversight bodies identify potential anti-competitive practices more effectively. By creating a comprehensive database of interactions, investigators can uncover hidden connections that might otherwise remain concealed.

Travel Monitoring
Travel monitoring offers a powerful tool for tracking sanctioned individuals attempting to evade legal restrictions. By integrating facial recognition with border control and transportation security systems, authorities can compare travelers' facial features against databases of restricted individuals. This approach enables real-time detection of attempts to use forged documents or circumvent travel bans, maintaining a detailed log of travel attempts by persons of interest.

4.1.1.4. Emerging Technology 4: Drones and Remote Sensing

If used correctly, drones and remote sensing technologies can play a role in preventing corruption and ensuring transparency and accountability across various sectors. These technologies could expose and prevent fraudulent activities that historically have been difficult to detect and verify (see Table 4.1.1.4). By providing real-time, detailed monitoring of projects and landscapes, these technologies enable comprehensive verification of infrastructure development, resource usage, and regulatory compliance.

In infrastructure development, where contractors have traditionally manipulated project reports and financial claims, drones offer real-time, objective monitoring. By capturing detailed visual evidence of construction progress, these technologies make it virtually impossible for contractors to misrepresent work completed or embezzle funds through fabricated progress reports. In resource management, drones directly combat corruption by exposing illegal activities that exploit public resources. They can definitively document unauthorized logging, track illegal mining operations, and verify mineral extraction quantities against official reports. This technological surveillance makes it challenging for individuals to illegally extract resources or underreport their economic activities. The use of satellites images to detect corruption in revenue collection in relation to properties and lands is also of relevance.[140]

Environmental regulation enforcement can also benefit from these technologies, since drones can document environmental compliance, track water rights usage, and monitor zoning regulations, creating a transparent mechanism that significantly reduces opportunities for corrupt practices. The ability to objectively record and verify compliance eliminates many traditional avenues for bribery and misrepresentation.

By offering an impartial, high-resolution view of landscapes and projects, drones and remote sensing technologies serve as critical anti-corruption tools, systematically dismantling opportunities for fraud and promoting a culture of transparency and accountability.

Table 4.1.1.4 Synergizing technologies to bolster prevention capabilities

UNODC – Innovation in Kyrgyzstan[141]	**Synergizing Multiple Technologies to Bolster Prevention Capabilities** *Integrating facial recognition with UAVs and ground sensors, Kyrgyzstan's anti-corruption framework exemplifies how combining multiple surveillance technologies can create more effective monitoring systems while optimizing resource use.* The United Nations Office on Drugs and Crime (UNODC) demonstrated an innovative approach to surveillance by combining Unmanned Aerial Vehicles (UAVs) with Unattended Ground Sensor (UGS) systems and facial recognition technology in Kyrgyzstan. This system aims to detect and prevent illegal activities, including corruption,

	by providing real-time data and accurate identification of individuals involved. The integration enables smart resource deployment. Rather than constant drone surveillance, the UGS system acts as a trigger for targeted drone deployment, making the operation more efficient and cost-effective. While initially implemented for drug trafficking prevention, this technological approach demonstrates significant potential for anti-corruption applications, particularly in: • Monitoring remote areas for illegal activities. • Protecting critical infrastructure. • Verifying regulatory compliance. • Gathering evidence for investigations. • Supporting coordinated enforcement actions.

Source: Access Partnership research/analysis

4.1.2. Detection

This section delves into the innovative detection and investigation methods enhanced by emerging technologies and how they can significantly improve anti-corruption efforts. By leveraging the capabilities of these technologies, organizations can identify patterns and anomalies, track suspicious activities, and optimize the management of vast data sets. These technological advancements not only streamline monitoring processes but also enhance the accuracy and efficiency of fraud detection and investigation.

4.1.2.1. Emerging Technology 1: AI/ML and Advanced Data Analytics

Pattern Detection and Anomaly Identification
AI/ML provides sophisticated methods for detecting corruption by analyzing complex data patterns that human investigators might miss (see Table 4.1.2.1).

In procurement processes, AI/ML algorithms can uncover suspicious bidding behaviors by detecting unusual patterns like consistently similar bid prices or statistically improbable winning sequences. Financial transaction analysis allows machine learning models to process massive datasets, establishing baseline behavioral patterns and instantly flagging transactions that deviate from expected norms. These algorithms can quickly detect red flags like unusually large cash transfers or transactions designed to obscure fund origins.

Table 4.1.2.1 Resource optimization as a benefit

Spain/OECD – Data-Driven Fraud Risk Assessment for Public Grants[142]	**Resource Optimization as a Side Benefit of ML-Based Fraud Detection** *While further improvements in data quality and risk indicators may be needed to refine the model, this proof-of-concept demonstrates the potential for data-driven approaches to substantially improve the efficiency and effectiveness of the IGAE's efforts to combat fraud in public grant programs.* Spain's General Comptroller of the State Administration (Intervención General de la Administración del Estado, IGAE) successfully implemented supervised ML to detect fraud in public grants by analyzing patterns in historical cases. In collaboration with the OECD, and with the support of the European Commission, this initiative aimed to enhance the

	IGAE's ability to assess fraud risks in public grants and subsidies, ultimately leading to more targeted control activities and efficient use of investigative resources. The project involved the use of supervised ML to analyze patterns in historical fraud cases related to public grants. The goal was to create a predictive model that could identify high-risk grants for further investigation. The approach began by merging 17 datasets from the IGAE covering information on grants, awards, and grant recipients. The final model predicted 42,152 high-risk grants out of 1,050,470 total grants with high accuracy, enabling the IGAE to prioritize these cases for further investigation. By focusing on high-risk cases, the IGAE effectively allocated its limited investigative resources, enhancing the overall efficiency of fraud detection efforts. In improving the model, the IGAE is looking to supplement the model with qualitative expert input and network analysis techniques to further enhance fraud detection capabilities.

Source: Access Partnership research/analysis

Network analysis enables AI to map intricate relationships between government officials and private entities, revealing hidden connections that might indicate inappropriate influence or conflicts of interest. By tracing complex webs of relationships, these systems can highlight potential improprieties that might compromise official decision-making.

Asset declaration monitoring represents another critical application. Machine learning can compare an individual's declared assets against their known income sources, rapidly identifying wealth discrepancies that suggest potential illicit enrichment. By integrating multiple data sources, AI creates comprehensive assessments of financial transparency.

Real-time transaction monitoring provides a proactive approach to corruption prevention. AI systems continuously analyze high-risk transactions across sectors, generating instantaneous alerts for potentially suspicious activities involving government contracts, permits, or transactions linked to politically exposed persons.

Document Review and Evidence Gathering

Automated processing of contracts and tender documents allows AI systems to rapidly analyze thousands of documents that would take human investigators months or even years to review. These advanced algorithms can identify subtle patterns, inconsistencies, and potential red flags across complex documentation. ML models can quickly detect anomalies, such as unusual pricing structures, repetitive contract language, or suspicious modifications, that might indicate fraudulent procurement practices (see Table 4.1.2.1).

The analysis of unstructured data represents a particularly powerful technological capability. AI can comprehensively examine emails, reports, communications, and other text-based documents, extracting meaningful insights that might reveal corrupt activities. These systems can seamlessly process multiple document formats, including scanned PDFs, handwritten notes, digital documents, and complex spreadsheets, to pull out relevant details with high accuracy. This capability ensures that no potentially critical information remains hidden due to formatting challenges.

Table 4.1.2.1 AI applications for enhancing transparency

	AI Applications for Enhancing Governmental Transparency and Preventing Corruption
The US Government Accountability Office (GAO) – LLMs[143]	*Developing comprehensive governance frameworks, maintaining high data integrity standards, ensuring continuous monitoring, and implementing rigorous auditing mechanisms will help transform AI from a technological tool into a powerful instrument of governmental accountability.* The potential anti-corruption benefits are significant, such as increased operational transparency, systematic anomaly detection, enhanced oversight capabilities, and reduced manual processing risks. By leveraging AI, government agencies can create more resilient systems that proactively identify and mitigate potential corruption risks, such as analyzing public comments, monitoring congressional activities, and processing survey responses.

Source: Access Partnership research/analysis

Cross-referencing information across different databases allows for comprehensive investigative analysis. ML algorithms can connect data from various sources, revealing complex networks of relationships and potentially suspicious interactions. By identifying connections that might not be immediately apparent, these systems provide investigators with a more holistic view of potential corrupt activities.[144]

Timeline construction emerges as another critical technological innovation. AI can automatically generate chronological sequences of events by analyzing multiple data sources, creating comprehensive narratives that track the progression of potentially corrupt activities. These dynamic timelines can help investigators understand complex sequences of interactions, financial transactions, and decision-making processes.[145]

Digital forensic analysis has been transformed by AI's ability to examine electronic evidence with unprecedented depth. ML models can analyze digital footprints, tracking electronic communications, financial transactions, and metadata to uncover hidden patterns of misconduct. These systems can detect subtle signs of manipulation, unauthorized access, or deliberate attempts to conceal information.

Public Engagement and Transparency

Interactive platforms for citizen reporting leverage AI technologies to create secure, efficient mechanisms for individuals to report potential corrupt activities. These sophisticated systems can categorize, prioritize, and route corruption reports with remarkable precision, ensuring that legitimate concerns are quickly directed to appropriate investigative bodies. ML algorithms can help verify the credibility of reports, protecting the system from false accusations while ensuring genuine concerns receive proper attention.

Automated translation services play a crucial role in detecting cross-border corruption and facilitating international cooperation. These advanced linguistic technologies enable seamless communication and information sharing across different languages, facilitating collaborative investigations and knowledge exchange between international anti-corruption agencies. By breaking down language barriers, AI ensures that critical information can be rapidly shared and analyzed globally.

Due Diligence

The process and depth of conducting background checks have been transformed by AI technologies, enabling comprehensive personal and corporate investigations that go far beyond traditional screening methods. Vanessa Hans, Head of Private Sector at the Basel Institute of Governance, highlighted that AI is primarily improving existing technologies, particularly in due diligence processes.

One of the most promising applications is AI-powered cross-matching technologies that can identify potential conflicts of interest. As ML algorithms can rapidly aggregate and analyze vast amounts of data from multiple sources, including financial records, legal databases, social networks, and public records, AI/ML systems can quickly identify suspicious patterns, undisclosed relationships, or potential red flags that might indicate a higher risk of corrupt activities. By creating holistic profiles that connect disparate pieces of information, AI can reveal complex networks of personal and professional relationships that might conceal conflicts of interest.

Media and public record monitoring offers another critical dimension of due diligence. AI-powered systems can continuously scan vast volumes of public information, tracking mentions, legal proceedings, news articles, and other publicly available data. These algorithms can create comprehensive risk profiles by aggregating information from multiple sources, providing real-time insights into potential corruption risks. The ability to process and analyze information instantaneously allows for proactive risk assessment, identifying potential issues before they escalate.

Corporate structure analysis represents a particularly powerful application of these technologies. AI tools can map intricate ownership structures, penetrating through complex layers of shell companies and corporate entities to reveal ultimate beneficial owners. AI/ML algorithms can detect unusual ownership patterns, identify potentially suspicious corporate arrangements, and highlight interconnections that might suggest attempts to hide illicit financial activities. These systems can uncover hidden relationships between seemingly independent entities, exposing potential collusion, inappropriate business practices, or conflicts of interest.

The implementation of AI in due diligence is not about replacing human judgment but augmenting it. By leveraging ML, organizations can process vast amounts of information more quickly and accurately, identifying potential red flags that might be missed in manual reviews. This approach is especially valuable for smaller departments or small and medium enterprises with limited compliance resources.

Investigation Support Tools

Modern AI technologies are transforming investigative processes by providing prosecutors, police, and compliance officers with powerful tools to streamline complex anti-corruption efforts. These advanced systems can rapidly process massive volumes of documents, interview transcripts, and declarative statements, identifying patterns and inconsistencies that would take human investigators exponentially longer to uncover.

In practical investigations, AI tools like READ.AI can analyze interview transcripts with unprecedented speed and precision. The technology goes beyond simple keyword matching,

employing sophisticated natural language processing to detect subtle linguistic inconsistencies, emotional variations, and potential areas of concern. By cross-referencing statements against existing databases and historical records, these tools can instantly flag potential discrepancies that might indicate fraudulent behavior or deliberate omission of critical information.

Language processing capabilities allow these tools to extract key information from multilingual documents, translate complex testimonies, and generate concise summary reports that highlight critical investigative insights. Prosecutors and other professionals can leverage these technologies to quickly synthesize large volumes of evidence, focusing their human expertise on strategic decision-making rather than laborious document review.

The most significant advantage of AI in corruption investigations is its ability to process information at a scale and speed impossible for human investigators. By identifying subtle patterns, detecting potential fabrications, and providing rapid cross-referencing, these tools serve as powerful assistants in the fight against corruption, enabling more efficient and thorough investigations.

Forensic Tools

Forensic analytics approaches allow investigators to efficiently sift through large datasets, connect disparate pieces of information, and prioritize the most promising leads for further examination (see Table 4.1.2.1). The insights generated can strengthen corruption cases and support more targeted interventions.

Tools like SMART (Self-Monitoring, Analysis, and Reporting Technology) are increasingly used by auditors in both the public and private sectors to combat corruption risk.[146] These tools are becoming more sophisticated and can handle real-time analysis of transactions, predictive modeling, and anomaly detection to flag potentially improper payments. Some of the most common uses include:

- **Anomaly detection:** Algorithms that identify unusual patterns, transactions, or behaviors that deviate from the norm and may indicate corrupt activities.
- **Network analysis:** Techniques that map relationships, connections, and flows between people, organizations, and financial transactions to uncover hidden links.
- **Text mining:** Natural language processing methods that scan documents, reports, and communications to surface suspicious keywords, phrases, or topics.
- **Link analysis:** To visualize and analyze the relationships between entities like individuals, companies, and bank accounts to reveal complex webs of illicit activity.
- **Predictive modeling:** Statistical and ML models that detect anomalies, forecast high-risk areas or individuals based on historical data patterns, identify potential fraud, and provide insights into complex corruption schemes.
- **Geospatial analysis:** Spatial mapping and visualization of data to identify geographic concentrations or clusters of suspicious activities.

Advanced analytic tools can also be applied to automate the analysis of whistleblower reports, audit findings, and other sources to surface potential corruption indicators, and conduct sentiment analysis of media coverage and public discourse.

Table 4.1.2.1 Advanced data analytics success stories

India – CDMA	**Transforming Audits with Data Analytics** *Investing in data management and analytics empowers supreme audit institutions like India's CAG to more effectively identify and prevent corrupt practices, thereby strengthening governmental accountability and transparency.* The Comptroller and Auditor General (CAG) of India established the Centre for Data Management and Analytics (CDMA) to enhance audit processes through advanced data analytics, significantly improving the detection of irregularities in government spending. CDMA integrates and analyzes large datasets related to government grants, expenditures, and awards. By employing sophisticated analytical tools, the CAG conducts targeted, risk-based audits that focus on identifying patterns indicative of corruption, leakages, and wasteful expenditure. The CAG's use of data analytics has allowed more targeted, data-driven audits, resulting in the identification of major instances of corruption, financial leakages, and spending inefficiencies.
World Bank – GRAS[147]	**Global Government Risk Assessment System for Enhancing Fraud Detection** *GRAS uncovers and addresses corruption in government contracting, enabling more transparent and accountable public procurement systems, which can be adopted by economies around the world.* The World Bank developed the Governance Risk Assessment System (GRAS), a tool that uses advanced data analytics to improve the detection of risks of fraud, corruption, and collusion in government contracting. GRAS was developed in Brazil, where it has been piloted in four sub-federal governments and has helped to investigate fraud, corruption and collusion in public procurement. Concrete results include the identification of over 850 suppliers with strong indications of collusive behavior, 450 suppliers likely registered under strawmen, 500 cases of conflict of interests involving suppliers owned by public servants, and about 4,500 companies with connections to political campaigns, among other examples.

Source: Access Partnership research/analysis

4.1.2.2. Emerging Technology 2: Blockchain

Blockchain analytics tools are transforming anti-corruption efforts by creating transparent, immutable transaction records and enabling secure, cross-institutional data sharing. These technologies provide robust mechanisms for tracking financial activities, protecting whistleblowers, and breaking down traditional barriers to investigative transparency.

Blockchain Analytics Tools

Blockchain analytics tools represent a revolutionary approach to tracking and investigating financial transactions. By creating an immutable, transparent ledger of all transactions, these technologies make it significantly more challenging for corrupt actors to hide illicit financial activities.[148] Each transaction is permanently recorded, cryptographically secured, and visible to authorized parties, creating a comprehensive audit trail that cannot be altered or deleted. This approach allows investigators to trace the precise movement of funds, identifying suspicious

patterns, unusual transfers, and potential money laundering attempts with remarkable precision.[149]

Data Sharing

Blockchain's ability to overcome data-sharing barriers addresses a critical challenge in corruption investigations. Traditional bureaucratic systems often create information silos, with different public entities reluctant to share critical data. Blockchain technologies create secure, decentralized platforms that enable seamless, transparent information exchange among law enforcement agencies, government departments, and investigative bodies.[150] This approach ensures that crucial investigative information can be shared instantly and securely, breaking down institutional barriers that historically have protected corrupt networks.[151]

Enhancing Whistleblower Protections

Whistleblower protection emerges as another significant application of blockchain technologies. These systems can create completely anonymous, tamper-proof reporting mechanisms that protect the identity of individuals reporting corrupt activities. By utilizing advanced cryptographic techniques, blockchain platforms can ensure that whistleblowers provide detailed evidence without fear of retribution. The immutable nature of blockchain records means that submitted information cannot be altered or deleted, providing a permanent, verifiable record of reported misconduct.

4.1.2.3. Emerging Technology 3: Facial Recognition

Facial recognition technology[152], as explained in previous sections, can positively impact investigative techniques by enabling sophisticated network mapping, global criminal identification, and asset tracing across multiple jurisdictions. While powerful, this technology raises critical ethical concerns about privacy, accuracy, and potential discriminatory outcomes in law enforcement applications.

Network Mapping

Network mapping represents a powerful application of this technology, enabling investigators to reveal intricate connections that might otherwise remain invisible (see Table 4.1.2.3). By analyzing photos from various sources, including meetings, public events, and surveillance footage, facial recognition algorithms can identify previously unknown associations between individuals.[153] This approach allows investigators to construct comprehensive social networks, revealing potential collusion patterns among government officials, private sector representatives, and other persons of interest. Facial recognition algorithms can flag suspicious recurring associations between officials and contractors, identifying potential collusion patterns that might indicate systemic corruption. This technology can also detect unauthorized access to restricted facilities by tracking and analyzing individual movements and identifying undisclosed meetings between parties of interest that might suggest inappropriate interactions. Corporate relationship mapping becomes particularly sophisticated through facial recognition. By linking corporate registration photos to known individuals, investigators can uncover shell company relationships that might be designed to conceal corrupt financial activities. This technology can penetrate complex ownership structures, revealing hidden connections between seemingly independent entities and exposing potential conflict of interest scenarios.[154]

Table 4.1.2.3 Network mapping with INTERPOL Facial Recognition

INTERPOL – Facial Recognition System[155]	**Network Mapping to Enhance Global Criminal Identification** *INTERPOL's efforts focus on balancing law enforcement capabilities with human rights protection and data privacy concerns, establishing IFRS as a model for the responsible deployment of facial recognition technology in law enforcement.* INTERPOL's Facial Recognition System (IFRS), launched in 2016, represents a significant advancement in international law enforcement technology. IFRS works by automatically encoding facial images and comparing them against stored templates. However, what sets the system apart is its dual-layer verification process, where qualified INTERPOL officers manually verify each identification generated by the software using internationally recognized methods, classifying results as "Potential candidate," "No candidate," or "Inconclusive." This human oversight helps maintain accuracy and reliability. The system has proven particularly valuable for real-time border control operations and processing images from INTERPOL Notices and Diffusions. Since its implementation, IFRS has aided in identifying thousands of individuals, including terrorists, fugitives, and missing persons. However, the system faces ongoing challenges, as facial recognition must account for variables such as aging, cosmetic surgery, and image quality. To maintain effectiveness, INTERPOL requires high-quality images, preferably meeting International Civil Aviation Organization (ICAO) passport standards. INTERPOL has also recognized the need for proper governance frameworks around this powerful technology. Through its Face Expert Working Group meetings and partnerships with organizations like the World Economic Forum and UNICRI, INTERPOL actively develops standards and best practices for member economies.

Source: Access Partnership research/analysis

Asset Tracing

Asset tracing takes on new dimensions with facial recognition technologies. Advanced systems can track suspect movement patterns across different jurisdictions by analyzing security camera footage and creating comprehensive movement profiles that can reveal suspicious behaviors. These advanced systems are especially powerful in linking luxury property ownership by cross-referencing real estate listing photos with public records and known individual databases. Asset verification systems can help identify potentially corrupt officials by tracking their presence in luxury properties or high-end service environments, creating visual evidence of unexplained wealth.

Nevertheless, facial recognition has raised several concerns due to unfair use, which has caused discriminatory outcomes. For example, the use of facial recognition technology by police in London sparked significant controversy and criticism from civil society groups. Furthermore, data from South Wales Police showed that over 89 percent of facial recognition flags have been incorrect since the technology was first deployed in 2017.[156]

4.1.3. Sanction

Emerging technologies are playing an increasingly critical role in the fight against corruption, although the uses for sanctioning and asset recovery are not as expanded and accepted as under other stages of these efforts. Advancements in these technologies could provide powerful tools

for tracking and recovering illicit assets, optimizing recovery processes, and enhancing transparency and accountability, although concrete examples and use cases are harder to identify. This section aims to summarize the current but, more importantly, the potential uses and the specific applications and benefits of these cutting-edge technologies in supporting anti-corruption initiatives.

4.1.3.1. Emerging Technology 1: AI/ML and Advanced Data Analytics

Sanctioning technologies powered by AI/ML and advanced data analytics can offer sophisticated mechanisms for asset identification and tracking that would enable the correct sanction of corrupt activities through advanced screening and monitoring processes.

Asset Tracking
AI/ML algorithms are instrumental in monitoring unusual asset movements and unexplained wealth, providing authorities with the tools to track digital footprints of illicit assets across multiple jurisdictions. These advanced technologies can identify complex money laundering schemes and hidden asset transfers through sophisticated transaction pattern recognition. By mapping relationships between entities, AI/ML uncovers hidden beneficial ownership and identifies shell companies and obscure corporate structures. Moreover, cross-border movement detection tools allow for the monitoring of international transfers and asset movements. AI-powered scanning of property registries across various jurisdictions further enhances the ability to track and recover illicit assets.

Recovery Process Optimization
AI-assisted decision-making is transforming the strategic planning of asset recovery. These technologies support optimal recovery strategies by analyzing vast amounts of data and providing actionable insights. Legal process automation streamlines documentation for recovery proceedings, reducing the time and resources required for manual processes. This not only accelerates asset recovery but also ensures greater accuracy and consistency in the documentation process.

Sanctioning Process Optimization
Automated screening represents a critical first line of defense in sanctions enforcement. Real-time AI and machine learning technologies enable instant identification of potentially sanctioned individuals or entities by checking against comprehensive sanctions lists. These advanced name-matching algorithms can now identify sanctioned individuals across multiple naming variations, languages, and transliteration formats, effectively addressing the challenges of manual screening processes.

4.1.3.2. Emerging Technology 2: Blockchain

Blockchain-Based Asset Registries
These registries can help track and freeze the assets of sanctioned individuals or entities, making it harder for them to conceal or move their holdings. The transparent and traceable nature of blockchain transactions creates a permanent audit trail that makes it much harder for sanctioned parties to conceal or move their holdings. Additionally, the decentralized, shared structure of blockchain data can facilitate international cooperation in identifying and freezing the overseas assets of sanctioned individuals across jurisdictions. The immutable records on the blockchain provide solid evidence to support asset seizure and recovery efforts, even for

assets that have been transferred multiple times. By leveraging these blockchain capabilities, governments and international bodies can more effectively track, freeze, and recover the gains of corrupt individuals and entities subject to sanctions, making it much harder for them to evade the consequences of their actions.

4.2. CHALLENGES AND RISKS

While AI/ML and advanced data analytics, blockchain, facial recognition, and drones present numerous advantages in fighting corruption, they also raise significant challenges and risks that must be carefully considered before accelerating the utilization of these emerging technologies and tools.

1. **Data Quality and Integrity**
   The effectiveness of AI/ML algorithms depends heavily on the quality and integrity of the data they are trained on. Inaccurate, biased, or insufficient data can lead to imprecise and restrictive outcomes, which is especially problematic in the sensitive context of detection of corruption. Poor data quality can result in unfair decisions, inaccurate red flag detection, and incomplete identification of corruption schemes. Additionally, if the data used lacks representation of certain groups, the AI models may disproportionately target specific populations, leading to discriminatory outcomes.
2. **Transparency and Explainability**
   AI systems often operate as "black boxes," making it difficult to understand how decisions are made. This lack of transparency and explainability is a major challenge, especially in complex corruption cases involving contextual factors that AI might not fully capture. Without clear interpretability, it is hard to audit these systems for fairness and validity, raising concerns about their use in high-stakes anti-corruption efforts.
3. **Vulnerability to Manipulation**
   Malicious actors may attempt to game or manipulate AI systems to obscure their illicit activities. This poses a significant risk as corrupt individuals and networks could potentially evade detection by exploiting algorithmic weaknesses. Continuous refinement and adaptation of AI-based models and tools are necessary to stay ahead of evolving corruption tactics.
4. **Over-reliance on Automation**
   Relying too heavily on automated AI tools can create a false sense of security and may lead to the over-delegation of crucial anti-corruption responsibilities. Human expertise, discretion, and oversight are essential to contextualize AI findings, verify conclusions, and make informed decisions in investigations and prosecutions. AI should complement, not replace, human judgment in anti-corruption efforts.
5. **Blockchain Implementation Challenges**
   While blockchain technology offers potential benefits, such as enhanced transparency and reduced human interference, it is not a panacea. Successful deployment requires meeting several prerequisites: accurate data, digitalized registries, reliable digital identity systems, sufficient connectivity, a tech-savvy population, and available technical support. Many developing economies lack these foundations, necessitating a focus on "getting the basics right" before advancing blockchain reforms. Additionally, regulatory uncertainty and governance issues pose significant challenges, as public, permissionless blockchains can

lack clear rule-setting and accountability mechanisms. The costs and scalability of blockchain applications also remain a concern, particularly for governments with limited digital infrastructure.

6. **Privacy and Due Process**
   Facial recognition technology raises serious privacy and due process concerns. It enables widespread surveillance without individual consent, infringing on privacy and freedom of movement. The lack of transparency in how facial data is collected, stored, and utilized creates a surveillance environment that can alter behavior due to perceived constant observation. Technical limitations, such as higher error rates for women and people of color, further exacerbate these concerns, leading to potential misidentification and false matches. The security vulnerabilities associated with storing biometric data are also significant, as breaches of facial data can have long-lasting implications.

7. **Regulatory and Oversight Gaps**
   The rapid adoption of technologies like AI/ML, blockchain, and facial recognition has outpaced the development of appropriate regulatory frameworks. Many jurisdictions lack specific laws governing its use, resulting in insufficient accountability and transparency. This regulatory gap leaves room for potential misuse and establishing robust and fit-for-purpose governance structures and oversight mechanisms is critical to ensure the ethical and fair use of these technologies.

   In particular, organizations must navigate intricate privacy laws and regulations governing surveillance activities while simultaneously ensuring robust data security and integrity. The integration of these technologies into existing anti-corruption frameworks requires careful consideration of organizational processes and culture, often necessitating significant procedural adjustments and changing management strategies. Measuring the effectiveness of these systems in fighting corruption also presents unique challenges, requiring organizations to develop appropriate metrics while balancing technological capabilities with investigative needs and resource sustainability.

8. **Implementation and Scalability Issues**
   Deploying advanced technologies for anti-corruption efforts requires addressing complex implementation challenges. Organizations must balance law enforcement needs with due process rights, establish comprehensive oversight mechanisms, and ensure ethical standards are maintained. The scalability of these technologies, particularly blockchain, often remains limited due to the significant computing resources required. Governments need to carefully assess whether the benefits outweigh the costs, especially in regions with limited digital infrastructure.

   Similarly, the implementation of drone and sensor systems in anti-corruption efforts faces several significant barriers, particularly in terms of resources and technical capacity. Organizations must overcome substantial initial investment costs for equipment and infrastructure while also developing specialized expertise for system operation and data analysis. The financial burden extends beyond procurement to include ongoing maintenance, training, and necessary technological updates. Additionally, these systems are constrained by environmental factors such as weather conditions and terrain, which can limit their effectiveness and reliability in certain contexts.

5. READINESS ASSESSMENT FOR APEC MEMBER ECONOMIES

5.1 QUANTITATIVE READINESS ASSESSMENT

As discussed in Section 2.2, the successful adoption of technology for anti-corruption requires more than just technical solutions – it demands a comprehensive ecosystem of supporting capabilities and infrastructure. While governments increasingly recognize technology's potential in combating corruption, their ability to effectively implement these tools varies significantly based on their institutional arrangements, legal frameworks, capacity-building programs, and public engagement mechanisms.

This section presents a systematic assessment of APEC member economies' readiness to implement both established and emerging anti-corruption technologies. Our assessment framework evaluates technology readiness across five key dimensions that align with the institutional requirements identified in Section 2.2:

- Digital infrastructure
- Human capital
- Institutional capacity
- Regulatory quality
- Legal frameworks

Outlined below in Table 5.1 is an overview of the five pillars in our framework and their sources. By combining indicators from the World Bank's Governance Indicators[157] and the UN E-Government Development Index, we draw on specific components from each source based on their relevance to the adoption of technology for anti-corruption and create a holistic measure that captures both technical capabilities and governance foundations (see Figure 5.1).

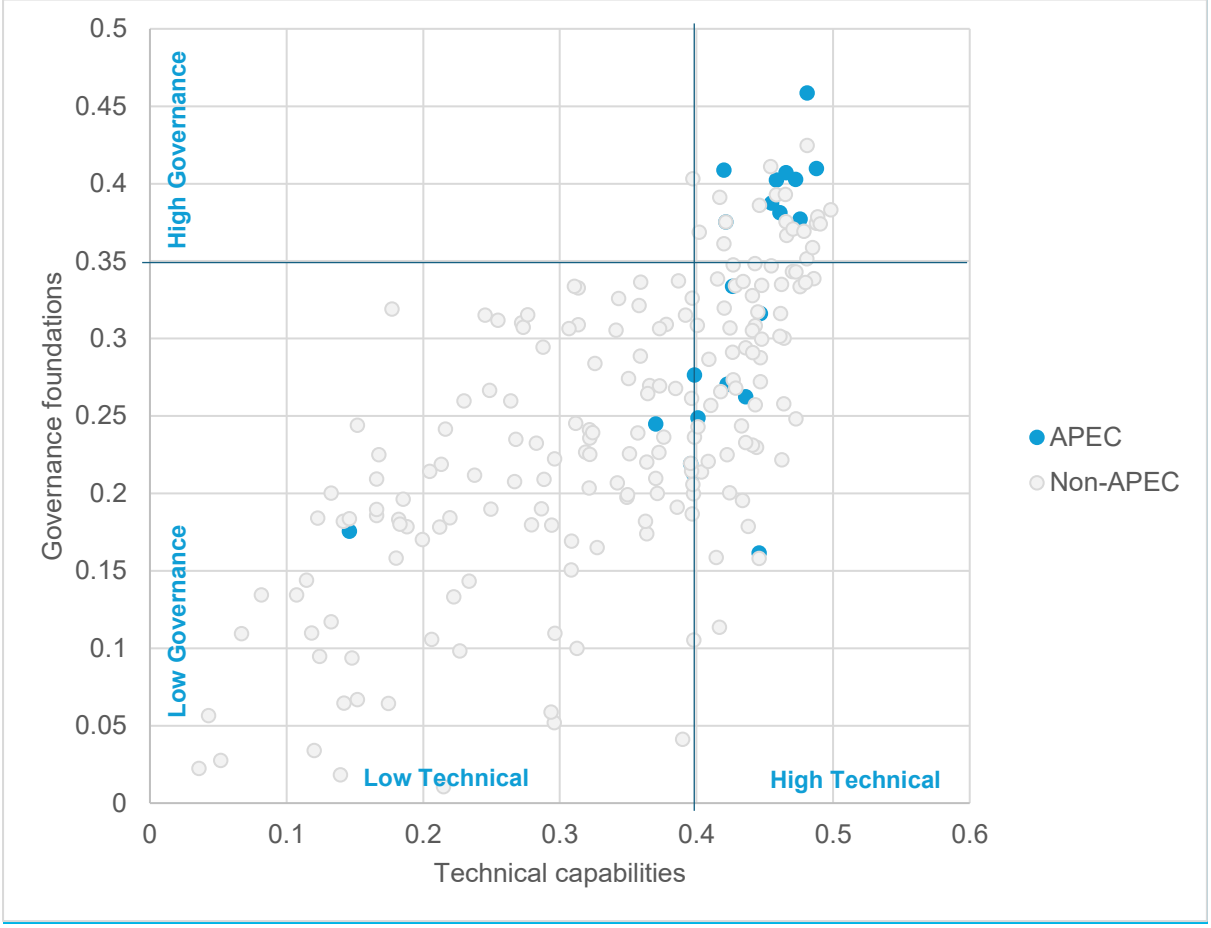
Table 5.1 Anti-corruption technology readiness assessment framework

Category	Pillars	Description	Primary sources	Data description
 **Technical capabilities**	**Digital Infrastructure**	Focuses on the technical foundation necessary for implementing advanced anti-corruption technologies	Telecommunication Infrastructure Index (UN E-Government Index)	Derived from normalized scores of four sub-indices: Internet users, mobile or cellular subscriptions, active mobile broadband subscriptions, and affordability
	Human Capital and Digital Literacy	Evaluates the population's ability to use and implement advanced technologies	Human Capital Index (UN E-Government Index)	Derived from normalized scores of five equally weighted sub-indices: adult literacy rate, gross enrollment ratio, expected years of schooling, mean

Category	Pillars	Description	Primary sources	Data description
				years of schooling, and e-government literacy.
Governance foundations	**Institutional Capacity and Governance**	Measures the ability of government institutions to implement and manage complex technological solutions	Government Effectiveness (World Bank Governance Indicators)	Derived from multiple data sources assessing public service quality, civil service effectiveness, infrastructure reliability, and government policy credibility. Individual variables from each source are standardized, aggregated, and normalized.
	Regulatory quality	Evaluates the government's capacity to develop and enforce effective, innovation-friendly regulations.	Regulatory Quality (World Bank Governance Indicators)	Derived from standardized variables evaluating government capacity to develop and implement sound policies and regulations that support private sector development. Data sources include assessments of bureaucratic quality, infrastructure reliability, policy stability, and public satisfaction with governance.
	Legal Framework	Assesses legal structures	Rule of Law (World Bank Governance Indicators)	Derived from standardized variables assessing contract enforcement, property rights, judicial independence, police effectiveness, and the prevalence of crime and violence. Data sources evaluate confidence in legal systems, efficiency of courts, protection of private property, and risks such as expropriation and organized crime.

Source: Access Partnership research/analysis

Figure 5.1 Governance capabilities vs. technical capabilities by economy (2 by 2 matrix)



Source: Access Partnership research/analysis

5.1.1. The Distribution of Technology Readiness Across APEC

Figure 5.1 shows the distribution of APEC economies across technical capabilities and governance foundations. While economies are not identified in the scatterplot, it reveals distinct patterns with important implications for anti-corruption technology adoption. This analysis examines how economies cluster in different quadrants of readiness and what this suggests for policy and implementation strategies. Data points from non-APEC economies have also been included for reference/benchmarking.

High Technical/High Governance Quadrant: Established Leaders
A select group of advanced economies occupies the high technical/high governance quadrant. These economies have achieved a critical balance: robust digital infrastructure and literacy combined with strong institutional capacity and legal frameworks.

An example of an economy in this quadrant is Singapore, whose position at the frontier of both dimensions demonstrates how this balance enables sophisticated anti-corruption efforts. Its sustained investment in digital infrastructure through initiatives like GovTech, coupled with strong institutional frameworks, has enabled the successful implementation of advanced anti-corruption systems. The experience of these leading economies suggests that effective anti-

corruption technology deployment requires excellence across both technical and governance dimensions.

High Technical/Lower Governance Quadrant: The Implementation Challenge
Several APEC economies show strong technical capabilities but face governance-related constraints. This misalignment creates significant challenges for anti-corruption technology adoption. Despite having built substantial technical infrastructure and well-educated populations, these economies face institutional and legal framework limitations that may reduce the effectiveness of anti-corruption technologies.

This quadrant illustrates a crucial insight: technical capabilities alone cannot ensure effective anti-corruption efforts. The gap between technical and governance capabilities creates risks that advanced technologies might be deployed without adequate institutional oversight or controls. This could potentially reduce the effectiveness of or, in the worst cases, enable technology to be co-opted or circumvented by bad actors.

Low Technical/Lower Governance Quadrant: Compound Challenges
Economies in this quadrant face compound challenges. Their position reflects broader development challenges that require comprehensive capacity building across multiple dimensions. The clustering of several economies near the quadrant boundaries suggests a potential transition situation, where targeted interventions could help cross critical thresholds in either technical or governance capabilities.

Note that there are no APEC economies in the Low Technical/High Governance quadrant. This pattern aligns with established political science research on administrative capacity and institutional development.[158] Economies with strong governance typically have more educated populations, better-developed infrastructure, and more advanced technology.

5.1.2. Implications on Actions

This quadrant analysis suggests that economies facing different circumstances need to pursue different strategies. For economies in the high-high quadrant, the priority should be leveraging their balanced capabilities to pioneer new applications of emerging technologies while developing governance frameworks to manage their use. Their experience can provide valuable models for others, particularly in maintaining alignment between technical capabilities and governance controls.

Economies with strong technical foundations but governance challenges should prioritize institutional strengthening and regulatory framework development. This includes building agency capacity, improving cross-institution coordination, and strengthening oversight mechanisms.

Economies facing compound challenges need carefully sequenced investments in both dimensions. Rather than trying to advance both simultaneously, these economies should identify critical gaps that, if addressed, could help cross important thresholds.

5.1.3. APEC's Role

APEC's diversity in technical and governance readiness creates unique opportunities for regional cooperation. Economies strong in one dimension can share experiences with those seeking to build similar capabilities. This enables more nuanced cooperation than traditional leader-follower models, as different economies can lead in different aspects of anti-corruption technology adoption.

The success of anti-corruption technology adoption ultimately depends on achieving the right balance between technical capabilities and governance foundations. Understanding where economies sit in this framework helps identify priorities for development and opportunities for targeted cooperation.

5.2. QUALITATIVE ASSESSMENT OF REGIONAL PROGRESS

Digital tools have become indispensable for combating corruption, with significant advancements observed across APEC economies. While the adoption of anti-corruption technologies varies widely, a consistent trend toward digital transformation underscores the region's commitment to leveraging technology for enhanced transparency and accountability.

5.2.1. Progress in Technology Adoption

APEC economies have made notable strides in integrating digital tools into governance frameworks. The transition from paper-based to digital documentation has been a foundational achievement, improving information management, increasing transparency, and reducing opportunities for misconduct. Key technologies, such as e-procurement systems, exemplify this progress.

E-procurement systems represent one of the most widely adopted and successful technologies for anti-corruption in the region (see Table 5.2.1). Korea's KONEPS, operational for over two decades, stands as a leading model. The recent Next-Generation KONEPS initiative aims to incorporate AI, big data, and cloud computing, setting new standards for public procurement processes. The system underwent user testing and pilot operation in 2024 with the aim of launching in the second half of the year.[159] Similarly, platforms like ChileCompra in Chile and CompraNet in Mexico continue to evolve, integrating features like public resource mapping and citizen oversight tools.[160] In 2024, Mexico began working on the development of a new Public Procurement Law, which directly influenced the transformation of the federal government's procurement platform. These systems not only improve efficiency but also empower public participation in governance, exemplified by Mexico's open public projects, which offer comprehensive access to investment project data.[161] This includes a feature map showing the location of the projects, a work plan and a database that anyone can use to have oversight on the expenditure and process of public investments. These examples highlight the dual benefits of efficiency and empowerment that such platforms can deliver when paired with strong institutional frameworks.

Table 5.2.1 Open standards for transparency

Open Contracting Partnership – Data-Driven Standards for Transparency	**Open Standards for Transparency in Public Procurement** *OCP's approach focuses not just on digitization but creating meaningful, data-driven systems that can detect irregularities and promote more open, competitive procurement environments.* The "Open Contracting Partnership" (OCP), an independent non-profit organization working to improve public procurement processes globally, has supported the deployment of several initiatives in the APEC region. The OCP has developed significant data-driven approaches to combat corruption, including its "red flag indicators" tool with approximately 700 indicators to detect procurement irregularities. It stresses the importance of having proper datasets and structured, machine-readable data, promoting open data standards and transparency throughout the procurement process.[162] There are several cases of its regional implementation: • Thailand implemented the OCP's Red Flag Indicators tool in its new Electronic Government Procurement[163] system upgrade, helping them identify potential irregularities in procurement processes that may require closer scrutiny. • The procurement authority of Indonesia is collaborating directly with civil society, including Indonesia Corruption Watch, to integrate red flag indicators through public dashboards to transparently monitor and address potential procurement risks.[164] • A new government in the Dominican Republic used the OCP data standards to structure procurement information. This approach enabled real-time risk detection, created public dashboards, and led to hundreds of new suppliers registering and measurable increases in competition.[165] These initiatives demonstrate a growing trend across APEC economies to use technology as a tool for preventing corruption, increasing transparency, and improving the efficiency of public procurement processes.

Source: Access Partnership research/analysis

Digital reporting and disclosure platforms represent a significant advancement in the fight against corruption, breaking down traditional barriers to reporting while improving protections for whistleblowers.

China has excelled in leveraging popular communication channels to detect and report corruption. Between August 2021 and April 2023, anonymous allegations and complaints posted on WeChat implicated 17 multinational and 15 domestic companies. These cases primarily originated from the healthcare sector, where provincial healthcare commissions actively encouraged whistleblowing by providing hotlines, WeChat accounts, and email addresses on their websites.[166] As a result, China witnessed soaring numbers of whistleblowing reports on social media alleging misconduct relating to life sciences companies. These allegations have included bribing healthcare professionals, collecting patient and prescription data, submitting fraudulent expense claims, misappropriating corporate funds, falsifying sales data, and workplace harassment and discrimination.[167]

In Australia, the Anti-Corruption Commission has also implemented a whistleblowing portal to report corruption. The portal enables individuals to report incidents of past or potential

corrupt conduct through an accessible form.[168] The information provided helps the Commission confirm that you are directing your concerns to the right agency and assesses if the matter represents corrupt conduct.

5.2.2. Persistent Challenges

Despite these successes, challenges remain pronounced across the region. Some economies with robust digital infrastructure and advanced tools often grapple with weak governance frameworks that limit the effectiveness of anti-corruption technologies. Conversely, economies with strong institutional capacity may lack the resources or technical expertise needed to deploy advanced tools effectively.

Public trust and engagement present another obstacle. In economies where skepticism toward government is high, citizens may hesitate to use digital platforms to report corruption or monitor public services. Additionally, limited digital literacy exacerbates these issues, especially in regions where access to technology is uneven.

Resistance to change within institutions further complicates adoption. Bureaucratic inertia and concerns over the disruption caused by new technologies can stall implementation efforts. This is particularly true in areas where entrenched practices and vested interests align to resist transparency-enhancing measures.

Finally, regional cooperation remains fragmented. Differences in legal systems, technical standards, and data-sharing protocols hinder the ability of economies to address transnational corruption collaboratively. These barriers emphasize the need for greater harmonization and interoperability within the APEC region.

6. OPPORTUNITIES, CHALLENGES, AND RECOMMENDATIONS

As APEC economies embrace technologies to combat corruption, they face a dual imperative: leveraging innovative tools to address complex corruption risks while ensuring their implementation aligns with institutional readiness, governance capacities and societal needs. This section presents an integrated vision for overcoming challenges and seizing opportunities, emphasizing the strategic role of technology across the anti-corruption value chain.

6.1. STRATEGIC VISION FOR ANTI-CORRUPTION TECHNOLOGIES

The integration of technology into anti-corruption frameworks offers transformative possibilities, but it is not a one-size-fits-all solution. Economies are encouraged to approach adoption through a layered strategy that recognizes diverse levels of readiness while prioritizing long-term sustainability. To be effective, this strategy should combine technological innovation with institutional reform, public engagement, and international collaboration.

Technologies such as AI/ML, blockchain, and advanced analytics are reshaping the ability to prevent, detect, and sanction corruption. However, their impact depends on context-specific factors, including the robustness of regulatory frameworks, the availability of technical expertise, and the accessibility of digital infrastructure.

At the core of this vision is a recognition that anti-corruption efforts must go beyond isolated technological interventions. Instead, they require comprehensive integration across the prevention, detection, and sanction stages of the anti-corruption value chain. This ensures not only efficiency but also the coherence and accountability of broader anti-corruption strategies.

6.2. ADDRESSING IMPLEMENTATION CHALLENGES

While the potential of technology is immense, several challenges should be addressed to ensure its effective deployment:

- **Overcome the fear:** Beyond traditional concerns about job displacement and workflow disruption, the sensitive nature of anti-corruption work makes stakeholders particularly wary of potential data breaches, surveillance misuse, and overreach of these tools. Additionally, the novelty of technologies like AI and blockchain creates natural scepticism, as unfamiliarity with these systems breeds distrust in their application to sensitive anti-corruption operations. Awareness campaigns to demonstrate how these technologies can enhance both efficiency and integrity in anti-corruption efforts are fundamental.
- **Ethical Considerations:** The use of technologies such as surveillance and data analytics raises legitimate concerns about privacy and misuse. In connection with the previous bullet point, building public trust requires transparency in implementation and accountability mechanisms to address potential abuses.
- **Governance and Policy Alignment:** Many economies lack the institutional frameworks needed to support advanced technologies. Clear regulations for data governance, privacy protection, and cross-border cooperation are critical.

- **Infrastructure Gaps:** Digital infrastructure remains unevenly distributed across the region, creating a digital divide that hinders smooth technological adoption. Economies are encouraged to prioritize investments in foundational infrastructure, including broadband connectivity and cybersecurity systems. Inclusive approaches that prioritize equity and accessibility will help build public trust and engagement, strengthening the broader anti-corruption agenda.
- **Capacity and Skills Development:** The complexity of emerging technologies requires a workforce equipped with both technical expertise and an understanding of governance implications. Continuous professional development and targeted capacity-building programs are essential.
- **Financial Challenges:** The implementation and maintenance of anti-corruption technologies present significant fiscal hurdles for many economies. High upfront costs for hardware and software acquisition, coupled with ongoing expenses for updates, security patches, and technical support, create substantial budget pressures. Additionally, recruiting and retaining specialized personnel with the necessary technical expertise demands competitive compensation packages that many public sector entities struggle to provide. These financial constraints are particularly acute for economies operating with limited fiscal resources, where difficult trade-offs must be made against other pressing development priorities. Sustainable funding models, including public-private partnerships and regional cost-sharing arrangements, should be explored to mitigate these financial barriers.
- **Organizational Challenges**: Successful technological implementation requires robust institutional capacity that many anti-corruption agencies have yet to develop. The integration of new technologies demands organizational restructuring, process reengineering, and culture change within established bureaucracies. Moreover, effective anti-corruption efforts typically span multiple agencies—including law enforcement, financial intelligence units, prosecutors, and courts—necessitating sophisticated inter-agency coordination mechanisms for data sharing and collaborative analysis. Institutional resistance to change, departmental silos, and competing priorities can severely undermine even well-designed technological solutions. Dedicated change management strategies and strong leadership commitment are essential to navigate these organizational complexities.
- **Sustainability and Scalability:** Technologies should be adaptable to different levels of readiness and scalable over time. Economies need strategies for gradual integration, ensuring that foundational systems can evolve to incorporate emerging innovations.

6.3. RECOMMENDATIONS FOR APEC ECONOMIES OF DIFFERENT READINESS LEVELS

Recognizing the diverse technological and institutional landscapes across APEC, implementation strategies should be tailored to the readiness levels outlined in Section 5. A framework of differentiated approaches ensures resource optimization and contextual relevance, and could demonstrate impact relatively fast by focusing on the more easily attainable initiatives/goals:

- **All Economies:** An often overlooked yet critical aspect of technology implementation in any field is viewing technology as an ally. Instead of a standalone solution,

technology should be seen as a resource that empowers anti-corruption efforts. As emphasized throughout the report, both established and emerging technologies complement human oversight and enhance capabilities across the anti-corruption value chain in various ways. As technology evolves, so do the corruption efforts that exploit those advancements. Anti-corruption initiatives, therefore, are encouraged to adapt alongside technological trends, together with policy and institutional changes, to ensure that technology remains a tool to fight corruption. This requires an institutional and organizational attitude that remains open to responsibly trying and testing the different available technologies, and striving to reduce barriers to effective utilization of these tools, including fundamental access to connectivity.

- **Low Readiness Economies:** Economies at the foundational stage should prioritize basic but impactful interventions, such as implementing simple e-procurement systems to enhance transparency and accountability. Strengthening foundational digital infrastructure, such as internet connectivity and basic IT systems, is critical to support future technological advancements. Where possible, the data collection systems should also be upscaled cost-effectively. Regional partnerships and alignment with international development organizations can facilitate access to funding and technical assistance, particularly in areas which can be considered as low-hanging fruits.
- **Moderate Readiness Economies:** Economies with moderate readiness should focus on maximizing the potential of established technologies like e-government portals and open data platforms. Targeted investments in infrastructure and capacity building can position these economies for the phased adoption of advanced technologies, potentially through the use of a regulatory sandbox. In ensuring the future readiness of their anti-corruption personnel, these economies should invest in specific capacity building and train officials on the basics of emerging technologies. The purpose of such training would not be to provide algorithmic literacy but to empower officials to be responsible and effective users of technological tools in anti-corruption efforts. As such, these trainings could focus on (i) understanding how AI tools operate, emphasizing aspects such as data storage, information protection, and (ii) the establishment of rules or guidelines for agency use. Participation in regional workshops and technical exchanges can help address skill gaps and prepare for more sophisticated tools.
- **High Readiness Economies:** These economies are well-placed to implement cutting-edge technologies such as AI, blockchain, and big data analytics. Specific actions include scaling real-time monitoring systems powered by AI, leveraging blockchain for secure and immutable transaction records, and applying big data analytics to enhance decision-making. In doing so, these economies should continue to stress test their implementation efforts, whether by minimizing duplication of efforts through cross-agency collaboration or sharing lessons learned from both successes and failures. Frequently observed mistakes or pitfalls, such as biases in AI/ML systems, should also be tracked to optimize deployment. These economies should also support regional initiatives by offering technical expertise and harmonizing standards across borders. While initiatives can be developed bilaterally or on an ad-hoc basis, high readiness economies may wish to lead the drafting of an APEC strategy/roadmap to promote

strategic coordination and collaboration of initiatives and ensure that strategic priorities both leverage the different strengths and meet the various needs of member economies.

In identifying strategic pathways to combat corruption, it is essential to focus on initiatives that offer the greatest impact with the least complexity and investment. Accordingly, Table 6.3 below categorizes various technologies discussed throughout this report that are particularly well-suited for immediate implementation within APEC member economies by the level of readiness. Building on the recommendations presented above, the table provides concrete instances of successful technology applications in anti-corruption efforts that can be considered for more immediate adoption or trial.

Table 6.3 Immediate opportunities for APEC economies by readiness level

Readiness Level	Opportunity Area	Low-Hanging Technologies/Use Cases
Low Readiness Economies	**Enhance transparency and accountability**	• **Digitize government services and records**: Minimize human intervention and increase transparency by moving services and records online. • **Implement e-procurement systems**: Improve efficiency, competition and public oversight in public procurement. • **Promote open data initiatives**: Enhance access to information, empower citizens, and facilitate data-driven analysis. • **Utilize basic analytics and rule-based methods**: Detect anomalies in financial data with initial technological implementations complemented by human oversight.
Moderate Readiness Economies	**Strengthen detection and investigative capacity**	• **Establish digital reporting and whistleblowing platforms**: Implement secure platforms with strong anonymity protections to encourage reporting. • **Adopt AI/ML tools for due diligence**: Conduct background checks and identify conflicts of interest using AI to prevent risks.
High Readiness Economies	**Improve enforcement and recovery processes**	• **Implement forensic data analytics**: Employ advanced data analytics for pattern detection, anomaly identification, and predictive modeling to investigate complex corruption schemes. • **Pilot test AI/ML for asset tracking and recovery**: Optimize asset recovery processes with appropriate governance and ethical considerations. • **Adopt facial recognition for network mapping**: Apply facial recognition for global criminal identification, ensuring privacy and ethical oversight.

Source: Access Partnership research/analysis

6.4. RECOMMENDATIONS FOR APEC

APEC's role as a regional convener provides unique opportunities to accelerate anti-corruption efforts:

- **Provide Strategic Guidance for Coordinated Collaboration on Specific/Priority Initiatives to Enhance Technology Utilization:** APEC could benefit from a consensus

on (i) the strategic priorities of member economies, possibly but not limited to technologies/use cases that are easier to implement, and (ii) the collaboration opportunities across the various readiness groups that should be pursued. This could reduce duplication of efforts by member economies, leverage their respective strengths, as well as increase efficiencies and impact when cross-jurisdictional learnings are shared. For instance, an initiative could be to establish platforms for member economies to share experiences and lessons learned, focusing on what has not worked and why, to inform better practices and facilitate a collective leap in anti-corruption achievements through technology. A strategic plan also (i) establishes an organizational vision for member economies to collaborate on over the next several years, which encourages efficient resource allocation and sustainability of effort, and (ii) offers APEC an opportunity to establish new standards as a key leader in enhancing the use of technology for cross-border anti-corruption efforts.

- **Capacity Building and Knowledge Sharing:** Organize regional training programs, technical workshops, and forums to disseminate best practices and innovative solutions. Establish a central repository for case studies, tools, and frameworks to assist member economies in implementation. Training programs should be strategically designed to address the three pillars of anti-corruption efforts, according to the readiness level of each economy:
    - For prevention-focused agencies such as anti-corruption offices, internal control units, and ethics committees, training should emphasize the use of data analytics for risk assessment and early warning systems, alongside the implementation of e-procurement platforms and transparency portals. These agencies should also master the development of integrity management systems and consider learning to leverage blockchain technology for asset declarations and conflict of interest monitoring.
    - Detection-oriented institutions, including police forces, financial intelligence units, tax authorities and customs, should receive specialized training in advanced data analytics techniques for anomaly detection and cross-border information sharing platforms. Their curriculum should cover digital forensics and cyber investigation tools, AI-powered pattern recognition for suspicious transactions, and the effective use of social media monitoring and open-source intelligence tools.
    - For sanctioning bodies such as the judiciary, specialized anti-corruption courts, and administrative tribunals, training should focus on case management systems and digital evidence handling. These institutions need proficiency in analytics tools for case prioritization and resource allocation, digital platforms for international legal cooperation, and automated systems for asset recovery tracking, as well as tools for managing complex financial evidence.

  This approach should also account for member economies' technological readiness levels and their institutional functions. For instance, low readiness economies can focus their training on basic digital tools and foundational systems across prevention, detection, and sanctioning bodies. Moderate readiness economies can advance to more sophisticated analytics and cross-border information sharing, while high readiness

economies could conduct training in advanced AI-powered systems and provide mentorship to others.

The analysis conducted in this report also indicates digital literacy gaps among both officials and citizens, ethical concerns regarding emerging technologies, and questions about the long-term sustainability of technological solutions. These concerns reflect the understanding that technology alone cannot address corruption: we must simultaneously build human capacity, establish appropriate governance frameworks, and ensure tools and systems remain effective over time. The digital divide within and between economies demands special attention to ensure that anti-corruption technologies do not inadvertently create new vulnerabilities. With these considerations in mind, the following complementary approaches to strengthen capacity building framework could be considered:

- **Digital Education and Inclusion:** Recognizing that technology-based anti-corruption measures are only as effective as the people who use them, APEC should promote comprehensive digital literacy programs targeting both public officials and citizens, with particular attention to vulnerable populations and those with limited technology access. These initiatives should:
    - Establish tiered digital literacy curricula for public officials at all levels, from basic digital skills to advanced technological competencies in emerging tools like AI, blockchain, and data analytics.
    - Assess the current levels of digital literacy of public officials and identify key gaps to be prioritized, potentially with other member economies to enhance efficiency and foster cross-border learning.
    - Develop community-based digital education programs to empower citizens to engage with transparency portals, reporting platforms, and other civic tech tools, thereby strengthening social accountability mechanisms.
    - Create specialized ethical technology training modules that address both technical operations and ethical decision-making frameworks when implementing anti-corruption technologies, ensuring officials understand privacy implications, bias risks, and appropriate use limitations.
    - Launch "train-the-trainer" programs to build a sustainable network of digital education champions within member economies who can continuously update and disseminate knowledge as technologies evolve.
- **Ethical Implementation and Governance:** APEC should facilitate the development of ethical regulatory frameworks governing the use of emerging technologies in anti-corruption efforts through:
    - Creation of a regional code of ethics for technology-enabled anti-corruption measures that establishes minimum standards for privacy protection, algorithmic transparency, and human rights safeguards.
    - Establishment of multi-stakeholder governance committees within each member economy to oversee the ethical implementation of advanced technologies such as facial recognition, predictive analytics, and automated decision systems.

  - Development of technology impact assessment templates and protocols that agencies can use prior to deploying new anti-corruption technologies, ensuring proper evaluation of both benefits and risks.
  - Facilitation of regulatory alignment or harmonization across the region to enable ethical cross-border cooperation on technology-enabled anti-corruption initiatives while respecting sovereignty concerns.

- **Sustainability and Long-term Implementation:** To ensure the longevity and continued effectiveness of technological anti-corruption measures, APEC should support the development of comprehensive technology sustainability plans that address not only initial implementation costs but encompass ongoing maintenance requirements, future upgrade pathways, and succession planning for technical expertise retention.
- **Technical and Financial Support:** Develop funding mechanisms and technical assistance programs to address disparities in readiness levels. APEC can act as a bridge to facilitate access to expertise, connecting member economies with international donors and private sector partners. These efforts should be complemented by the creation of regional technology maintenance networks enabling economies to pool resources, share specialized expertise, and distribute costs associated with keeping anti-corruption systems operational and current. Additionally, establishing dedicated innovation funds would ensure continuous improvement of existing technologies while allowing exploration of emerging solutions without straining operational budgets.
- **Monitor and Evaluate Progress:** Establish mechanisms to assess the adoption and effectiveness of anti-corruption technologies across member economies. For instance, APEC can support the development and implementation of regular assessments to track the adoption and effectiveness of anti-corruption technologies, identifying gaps and areas for improvement. Regular technology audits and refresh cycles should be institutionalized to prevent the obsolescence of anti-corruption systems, with approaches tailored to each economy's resource capabilities, thereby ensuring that technological investments deliver sustained value rather than becoming costly technological relics.

By aligning its efforts with the Putrajaya Vision 2040 and its emphasis on digital transformation, APEC can lead the way in building resilient, transparent, and accountable governance systems that effectively combat corruption.

6.5 CONCLUSION

The integration of technology into anti-corruption frameworks represents a critical opportunity for APEC economies to address one of the most persistent challenges of our time. Technology, when viewed as an ally, empowers anti-corruption efforts by enhancing transparency, bolstering accountability, and building trust. Yet the effectiveness of these technologies hinges on human oversight and control. All tools discussed in this report require different levels of human intervention to ensure they align with strategic objectives and ethical considerations, and this human-technology interaction will continue to evolve as technological advancements are made.

Equipping key stakeholders with the necessary skills and ensuring they remain up-to-date with evolving advancements is crucial for sustained success. Comprehensive training programs are necessary to ensure that implementers not only understand the technical aspects of new tools but also grasp the broader anti-corruption strategies they support. This dual focus ensures that technology is applied in ways that align with strategic objectives and ethical considerations. Moreover, balancing protection and safety with innovation is essential. While safeguarding against misuse and ensuring privacy is paramount, encouraging responsible experimentation and adoption of new technologies can drive significant advancements in anti-corruption efforts. Governments should create conducive environments that allow for the exploration of various tools, supported by robust regulatory frameworks that mitigate risks without stifling innovation. And, in doing so, a culture of continuous learning and adaptation will emerge, equipping economies with a broad pool of "good users" who are capable of leveraging technology to its full potential.

As APEC continues to champion innovation and cooperation, it can set a global example of how to combat corruption in the digital age, demonstrating the powerful synergy between advanced technology and skilled human oversight – the essential combination for combating corruption.

APPENDIX

A.1.1. DATA USED FOR THE QUANTITATIVE ANALYSIS

Table A.1.1 Quantitative analysis data

Dimension (Source)	Description	Relevance for Anti-Corruption Technology Readiness
Government Effectiveness (World Bank Governance Indicators)	This dimension reflects perceptions of the quality of public services, the quality of the civil service and its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	Government Effectiveness receives a **high weighting** in the Readiness Index due to its multifaceted impact on an economy's readiness to adopt and implement such technologies: • It encompasses critical elements like the quality of public services, which often correlates with advanced digital infrastructure and e-government capabilities, providing the necessary technological foundation. • The measure also reflects a government's proficiency in policy formulation and implementation, indicating its capacity to develop and execute complex strategies for integrating anti-corruption technologies. • The measure also captures civil service competence and institutional strength, both crucial for understanding, managing, and successfully integrating sophisticated anti-corruption tools into existing systems. • The administrative capacity component is essential for navigating the complexities of emerging technologies, ensuring their effective deployment and sustainable use in anti-corruption efforts.
Regulatory quality (World Bank Governance Indicators)	This indicator captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Regulatory Quality, while important, receives a **lower weighting** in the Readiness Index for several reasons: • It is indicative of an economy's capacity to develop frameworks supporting the adoption of advanced anti-corruption technologies. • The indicator assesses how governments foster private sector development, which can indirectly contribute to an environment conducive to innovation and implementation of cutting-edge anti-corruption technologies. • Economies with better regulatory quality often have more efficient bureaucracies, potentially facilitating faster adoption and

Dimension (Source)	Description	Relevance for Anti-Corruption Technology Readiness
		implementation of new technologies in the public sector. • However, Regulatory Quality focuses more on the general regulatory environment and private sector development, rather than directly addressing the government's capacity to implement anti-corruption measures, making its influence on anti-corruption technology adoption often indirect and supportive rather than a primary driver of readiness.
Rule of Law (World Bank Governance Indicators)	This indicator captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Rule of Law merits inclusion in the Readiness Index with a **lower weighting** for the following reasons: • It captures the strength of the legal framework and enforcement mechanisms, essential for implementing and regulating anti-corruption technologies effectively. • Judicial independence, reflected in this indicator, is crucial for ensuring anti-corruption technologies can operate without undue interference. • However, some aspects of institutional quality that it measures overlap with Government Effectiveness and Regulatory Quality indicators. • While it broadly addresses societal order, which indirectly impacts the anti-corruption environment, this is not a primary driver of technological readiness. • Its inclusion, despite the low weighting, acknowledges the importance of a stable legal environment for the successful implementation and sustainability of anti-corruption technologies.
Telecommunication Infrastructure Index (TII) (UN E-Government Index)	The TII measures the existing infrastructure that enables citizens to participate in e-government. It includes metrics such as: • Estimated number of internet users. • Number of main fixed telephone lines.	The TII merits a **medium/high weighting** in the Readiness Index for several reasons: • It provides a crucial measure of the digital foundation necessary for implementing advanced anti-corruption technologies, including AI, blockchain, and other emerging tools. • The TII reflects an economy's capacity for data collection and processing, which is

Dimension (Source)	Description	Relevance for Anti-Corruption Technology Readiness
	• Number of mobile subscribers. • Number of fixed internet subscriptions. • Number of fixed broadband facilities (per 100 inhabitants).	essential for many frontiers anti-corruption technologies that rely on analyzing large volumes of data. • A robust telecommunications infrastructure enables comprehensive e-government services, potentially reducing corruption opportunities by minimizing human intervention and increasing transparency. • However, the TII is only a rough proxy for the specific infrastructure relevant to anti-corruption technologies, as it includes broader metrics like fixed telephone lines and mobile subscriptions.
Human Capital Index (HCI) (UN E-Government Index)	The HCI assesses citizens' ability to use e-government services, considering factors like education levels and digital literacy.	The Human Capital Index (HCI) merits a **medium/high weighting** in the Readiness Index for several reasons: • It assesses citizens' ability to use e-government services, which is crucial for the effective implementation and adoption of advanced anti-corruption technologies. • A higher HCI often indicates better education levels and digital literacy among the population, ensuring a larger pool of skilled users and potential developers for anti-corruption technologies. • Economies with well-developed human capital are likely to have a workforce more adaptable to new technologies, which is essential for the successful adoption of emerging anti-corruption tools. • Higher HCI scores suggest a larger pool of capable of implementing, maintaining, and improving complex anti-corruption technologies.

A.1.2. EXPERT/INTERVIEW LIST

- Ms. Barbara Tsai, General Counsel, Head of Compliance, Microsoft
- Ms. Boonyarat Kittivorawut (Foung), Senior Manager for Asia, Open Contracting Partnership
- Mr. Brook Horowitz, CEO, IBLF Global
- Ms. Carolina Echevarria, Head, Global Secretariat, Alliance for Integrity
- Mr. Gavin Hayman, Executive Director, Open Contracting Partnership
- Ms. Elizabeth David Barret, Head AC Center, Sussex University
- Mr. Mark Lovatt, CEO and Principal Consultant of Trident Integrity Solutions and Co-founder & Secretary General, Business Integrity Alliance
- Dr Torplus Yomnak, Director of Political Economics Studies Centre, Chulalongkorn University
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125 Member States and Parties to UNCAC whose authorities have GlobE membership

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