

## **The Global Trust Engine: The Creation of a ML4DI (Machine Learning for Development Integrity) Model Capable of Detecting and Combatting Fraud in the Development Arena**

### **Theoretical Framework**

#### **Defining Corruption**

The United Nations Development Programme (UNDP) defines corruption as the “misuse of entrusted power for private gain” (UNDP, 2008, pg. 7). Corruption operates across both private and public sectors, taking forms such as bribery, fraud, and extortion (UNDP, 2008, pg. 7). In the context of foreign aid and development, corruption is undertaken by bureaucratic officials who exploit their power in order to “further their own interests”, often diverting funds intended for social programs, infrastructure projects, or economic development into their political and personal pockets (Blackburn et al., 2006, pg. 2448). Former United Nations Secretary-General Ban Ki-Moon explained that roughly 30% of development funds or foreign aid is “devour[ed]” by corruption before reaching the recipient country (Quibiria, 2017, pg. 10). Thus, corruption is not just a financial crime; it is fundamentally a governance issue rooted in structural weaknesses.

#### **Causes of Corruption**

The UNDP outlines several factors that contribute to widespread corruption, indicating that corruption “thrives” in environments with limited accountability, powerful monopolies, and poor government transparency (UNDP, 2008, pg. 5). Furthermore, the UNDP points to underlying systemic causes such as low public-sector wages, weak enforcement systems, as well as “institutional weaknesses in the legislative and judicial systems” (UNDP, 2008, pg. 10). These structural conditions, combined with low corruption detection rates, foster an environment where the rewards of corruption outweigh the risks, enabling recipient countries to become “effective breeding grounds” for corrupt practices (UNDP, 2008, pg. 10).

#### **Money Laundering**

One of the main mechanisms by which corruption occurs is through money-laundering. Money-laundering is the process by which “the proceeds of crime are run through the financial system to disguise their illegal origins and make them appear to be legitimate funds” (Scott, 1995, pg. 1). To conceal the illicit nature of these funds, launderers will “merge their illegal cash” into legitimate financial channels such as a “legal business, bank, or real estate” (UNODC, n.d.). Money-laundering occurs in three distinct stages, each designed to further obscure the origin of the illegal funds. First is the placement stage, which involves severing the money from its “direct association with the crime” (UNODC, n.d.). Next is the layering stage, in which the trail of the funds is “disguis[ed]” (UNODC, n.d.). Last is the integration stage, where the money becomes available to the criminal from the seemingly legitimate sources (UNODC, n.d.).

#### **Effects of Corruption**

The effects of corruption are detrimental to the already unstable countries which are most impacted. Perhaps the most visible consequences of corruption are economic: corruption diverts valuable funds and resources away from “growth-promoting areas” such as health, education, and infrastructure investment; these funds are instead put towards the personal interests of those in power (Blackburn et al., pg. 2449). As a result, corruption makes these countries less appealing destinations for private investment, further weakening markets and limiting job opportunities (Diagana & Diagne, 2023). In addition, corruption produces significant social and political consequences: the UNDP explains that corruption “undermines the rule of law” leading to the “violation of human rights” and the establishment of “an anti-democratic environment” (UNDP, 2008, pg. 6). By diverting development funds, corruption “undermin[es] a government’s ability to provide basic services”, therefore perpetuating inequalities and injustices (UNDP, 2008, pg. 5).

### **The Vicious Cycle of Corruption**

The persistence of corruption can be understood as cyclical: corruption both causes and results from weak institutions, poverty, and inequality; this creates a self-reinforcing vicious cycle that is difficult to break. In countries with limited governance, high inequality, widespread poverty, and “perverse economic incentives”, individuals may turn to corruption in order to feed their families (UNDP, 2015, pg. 16). Consequently, the country’s institutions and government are undermined through the diversion of resources away from infrastructure and social services. With already weak oversight and limited accountability, corrupt practices become normalized (Blackburn et al., 2006, pg. 2449). As corruption continues, inequality worsens, economic growth slows, and citizens may feel compelled to engage in corrupt practices to survive, thus feeding back into the system.

### **Economic Necessity**

The use of Machine Learning is urgent and necessary for the intervention of fraudulent activity and corruption (Odufisan, Abhulimen, & Ogunti, 2025). Traditional methods have become inefficient and inadequate; they struggle with complexity, behavioral factors, large scale real time data and rely on historical data (Zhang, Lecture 2025). These systems empower and train machines to learn large and complex data sets, analyze algorithms and recognize patterns. Machine learning models perform in universal ways in different sectors of the economy. For example, banking and finance through analyzing customer behaviour and spending patterns, money laundering schemes (Hassan et al., 2023), e-commerce through analyzing purchase histories, detecting IP addresses and fraudulent merchants (Paul and Nikolaev, 2021), healthcare through flagging identity theft, medical and billing data, patient records (Kasaraneni, 2024), education through academic integrity, plagiarism, cheating, admission fraud (Odufisan, Abhulimen, & Ogunti, 2025). Machine learning models have the power to work in real-time, monitoring trades, transfers and financial flows while analyzing datasets to flag any suspicious activity before they can cause serious harm. These systems are able to create risk assessment

models by being trained per piece of data to alert of any sign of suspicion. Machine learning models work on improving performance beyond what traditional models can handle in order to create secure, accurate and effective financial environments.

## **Relevance**

This approach has become extremely relevant within the world we live in today. E-Finance and AI are the future as financial development is becoming more and more digitalized. As a society, we must adapt and innovate to maintain secure, accurate and effective environments (Zhang, Lecture 2025). Human oversight alone cannot process millions of transactions per second; consequently, billions of dollars are lost annually to corruption, fraud, and embezzlement across sectors. As financial markets, digital currencies, and electronic payment systems expand globally, the potential for misuse increases (Zhang, Lecture 2025). Our Global Trust Engine's mission is to address this issue at hand by using a data-driven mechanism to assess risk in real time, specifically for developing economies where fraudulent activity and corruption are able to destabilize the economy at a large scale. As technology evolves, there is an urgency for stricter regulations and the tightening of traditional mechanisms, where these systems can support our primary institutions. Machine Learning can prevent large-scale financial losses and prioritize security of all parties involved. Risk assessment is crucial as more and more sectors are becoming vulnerable to manipulation. Machine Learning promotes financial integrity and strengthens the credibility and transparency of both domestic and international institutions, so nothing can be done under the radar without being flagged.

## **Policy Implications**

Machine Learning Systems are always learning and therefore always improving to perform real-time analysis, reduce inaccuracies and false positives and identify immediate anomalies in data that humans may miss (Bansal et al., 2024). The innovation of these models create a secure and more trustworthy digital environment, improve the accuracy of predictions, advance sustainable economic growth and promote financial stability within institutions (Desai, 2023). Additionally, machine learning models empower the use of digitalization (Odufisan, Abhulimen, & Ogunti, 2025). The Global Trust Engine reinforces the credibility of machine learning mechanisms for risk assessment and financial transparency. The findings confirm that measurable governance indicators can reliably signal early signs of financial and political vulnerability, underscoring the model's potential as a proactive policy tool. Moving forward, institutions can adopt these measures to identify high risk environments and develop proper safeguards to combat corruption accurately through anomaly detection, risk analysis and text analysis. However, we acknowledge that our model cannot capture some of the non-quantifiable factors that play a role in reducing governance like historical data and legacies that shape corruption and fraudulent patterns.

## Case Study Analysis: Quantitative and Qualitative Instruments

### **Mozambique**

The Hidden Debt Crisis in Mozambique was a product of the illicit use of \$2 billion USD in loans on behalf of Mozambican officials. The initial flows of these funds are described by the transfer of \$2 billion USD to three state-owned companies in Mozambique from a Russian and Swiss Bank (CHR Michelsen Institute, 2021, 16). The loans were offered to Mozambican enterprises for the sake of developing maritime security and empowering the fishing industry, a goal ultimately poisoned by the diversion of these funds to corrupt government officials who stole them for their own benefit and private investment. The primary organizer of the scheme, former Mozambican Finance Minister, Manuel Chang, received an additional \$7 million USD in bribes to help facilitate the relocation of the funds (U.S. Department of Justice, 2024). These funds were laundered upon their integration into the formal economy, as they were funneled through sales to defrauded foreign investors from the United States. He illegally diverted more than \$200 million USD of the development funds into private pockets for personal benefit, ultimately leading to his conviction in the United States in 2024 (U.S. Department of Justice, 2024). The laundering scheme and procedure for theft collapsed as state-owned companies defaulted on over \$700 million USD in loans. From the case of Mozambique, we observe a series of quantitative and qualitative patterns that are listed in *Table I* which serve the capacity to train a Machine Learning model to detect and prevent such corruption in the future.

### **Malaysia**

The 1MDB development bank in Malaysia was initially a state fund chaired by former Prime Minister Najib Razak. The fund served the purpose of empowering Malaysia's economic growth through foreign direct investment (FDI) and global partnerships. These goals remained unmaterialized due to the theft of \$4.5 billion USD, orchestrated by several Malaysian government officials, most notably the former Prime Minister Razak (The Guardian, 2020). The funds were diverted toward a series of extravagant investments including luxury homes and properties in Beverly Hills, New York, and London, alongside a superyacht and fine art by Monet and Van Gogh (US Department of Justice, 2024)). With complicity from a series of global banks, Razak was able to siphon stolen funds through accounts internationally and conceal the illegal procedures through which he illegally obtained the funds. The magnitude of this corruption can be observed through Malaysia's relatively low scores on governance indicators and measures of corruption as listed in *Table I*. Similarly to Mozambique, these instruments for measuring corruption allow us to develop a Machine Learning model capable of detecting quantitative and qualitative patterns that commonly arise among cases of corruption, allowing us to prevent a future catastrophe that may similarly exploit the development of marginalized population for the expansion of the wealth of economic elite like Razak.

Measure of Corruption	Canada (Control)			Malaysia			Mozambique		
	2013	2018	2023	2013	2018	2023	2013	2018	2023
Governance: Voice and Accountability	1.45	1.5	1.48	-0.34	-0.1	0.09	-0.26	-0.48	-0.59
Governance: Political Stability and Absence of Terrorism	1.06	0.96	0.82	0.05	0.25	0.17	-0.23	-0.83	-1.27
Governance: Government Effectiveness	1.78	1.68	1.52	0.99	1.05	0.88	-0.64	-0.96	-0.72
Governance: Regulatory Quality	1.73	1.7	1.64	0.57	0.58	0.66	-0.42	-0.8	-0.71
Governance: Rule of Law	1.75	1.72	1.47	0.34	0.53	0.57	-0.82	-1.07	-1.03
Governance: Control of Corruption	1.88	1.79	1.67	0.33	0.3	0.3	-0.6	-0.81	-0.83
World Bank MIMIC Estimate	15.3	15	NA	30.7	29.1	NA	37.9	37.2	NA

*Table 1: Quantification measurements of corruption in Malaysia and Mozambique relative to Canada. (World Bank, 2025)*

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