Technological Advancements and Legal Challenges to Combat Money Laundering: Evidence from Pakistan

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ABSTRACT

The primary objective of this research article is to examine technological advancements and legal challenges to combat crime of money laundering in context of Pakistan. The risk of money laundering, as well as the considerable threat posed by terrorist funding, poses a serious danger to the socioeconomic equilibrium of Pakistan. In today's world, money laundering is a huge financial problem as well as a crime. Billions of dollars are smuggled illegally across international boundaries each year. Laundering ill-gotten gains has developed into a significant issue in the world's financial system, and the authorities are working hard to eliminate it. Technology doesn't always advance positive outcomes. With the advancement of technology, financial crime tactics are becoming more sophisticated. The most common method of money laundering is through financial systems. Therefore, banks are obligated to make use of technology to combat the practise of money laundering. However, technology can help financial institutions such as banks to fight against financial crimes. Any institution that chooses to ignore AML guidelines runs the risk of incurring punishment, such as monetary penalties. Therefore, this paper fills this gap by critically examining the legal challenges faced by financial institutions in Pakistan in their use of technology to combat money laundering. For this research, the qualitative doctrinal research methodology is used that is based on documentary analysis. This research critically analyses the legal challenges faced by financial institutions such as banks in their compliance with anti-money laundering regulations. This paper critically examines the parliamentary statutes, regulations, policies in various domestic jurisdictions and international statutes, treaties, conventions and other existing data relating to technological advancements to combat money laundering.

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1. Introduction

It is possible that financial institutions lack the desire and resources necessary to evaluate the amount of money laundering in their accounts, which leads to the lack of knowledge regarding the true breadth of activities related to money laundering. In a report to the United States Congress, it was estimated that between 0.05 and 0.1 percent of the transactions that were carried out through the Society for Worldwide Interbank Financial Telecommunications system comprised illegal activities related to the laundering of money (Jullum, Løland, Huseby, Ånonsen, & Lorentzen, 2020). According to a meta-analysis that was conducted by the United Nations Office on Drugs and Crime (2011), the total amount of cash that is laundered through the banking system is roughly 2.7 percent of the world's GDP, which is equivalent to approximately $1.6 trillion in 2009 (Ramos & Ashby, 2013). Because of the significant threat that large-scale financial crime presents to economies and societies all over the world, it is imperative that as many fraudulent transactions as is humanly feasible be uncovered.

The term "anti-money laundering," or "AML," refers to a combination of rules, procedures, and legal frameworks that prohibit the "laundering in" of money that has been obtained via criminal activities such as the selling of illegal drugs. Regardless of any systems in place, it is becoming increasingly difficult to verify the identities of users as the digitalisation continues to grow. This makes it much simpler to launder money (Korejo, Rajamanickam, & Md. Said, 2021). The processes involved in AML compliance have long been complicated and expensive for financial institutions. Because there are millions of transactions taking place every day in different parts of the world, it can be challenging to successfully trace each and every one of them. The solution to this extremely important problem is technology that is compatible (Kumar, 2012).

Pakistan is one of the countries that has persistent problems with the practise of money laundering. A significant issue for Pakistan is the prevalence of financial crimes such as narcotics and people trafficking, as well as corruption and the funding of terrorist organisations. According to the Corruption Index compiled by Transparency International, Pakistan is ranked 31st out of a total of 100 nations (Uroos, Shabbir, Zahid, Yahya, & Abbasi, 2022). Because of the location and the level of corruption, there is a greater potential for smuggling, fraud, and kidnapping. Pakistan ought to put into action an efficient anti-financial crime plans due to the dangers related with its location as well as the corruption that exists there.

Financial Action Task Force (FATF) is major watchdog agency that works for detection and prevention of money laundering at international level. According to the FATF, new technology has the potential to increase the efficacy, speed, and reliability of actions taken to fight money laundering and the funding of terrorists. They are able to assist in the precise, quick, and in-depth evaluation of these risks that may be performed by banking institutions and authorities. When AML procedures are put in place prudently and in accordance with a risk-based methodology, the efficacy of these procedures can be improved, which leads to an increase in financial inclusion. Financial inclusion can be increased when innovative products and services bring more people into the governed financial system (Mekpor, Aboagye, & Welbeck, 2018).

To combat the ever-evolving problem of international money laundering and the financing of terrorism, the FATF has developed standards that are both flexible and effective. In addition, the FATF Specifications may be modified to account for difficulties discovered during implementation. Customer due diligence (CDD) and associated practices have significantly improved transaction transparency over the past thirty years since they were first implemented. This has made it far harder for lawbreakers, terrorist financial backers, and financiers of firearms proliferation to misuse financial instruments. This improvement has occurred despite the fact that financial instruments have been around for thirty years. Yet, although being a crucial tenet of the AML system, client identification/verification and monitoring still faces implementation and efficiency issues (Naheem, 2019).

Non-risk-oriented CDD activities may be viewed as costly and unsuccessful due to the fact that they require time and money but typically do not result in credible risk assessment methods or simple access to financial services. This may lead to the perception that these activities are expensive. In light of the intensifying pace of technological advancement, the substantial impact that digital transition on the banking markets, and the desire for improved efficacy of FATF Standards, the FATF started an initiative to investigate the potential for novel technologies to reduce the danger of malicious software. When compared to the use of traditional techniques and procedures, the implementation of new technologies has the goal of lowering the costs associated with implementing the AML framework more generally as well as increasing the speed, quality, or efficiency of specific AML measures (Demetis, 2018). The technologies that are most applicable are interdisciplinary and offer novel digital approaches to the data collecting, processing, and evaluation processes. Also, these technologies make it possible to transmit data and information through a wide variety of specialised methods. These tools have the potential to be used with one another in order to fulfil a wide range of AML objectives. The full extent of many of these cutting-edge technologies' capabilities and repercussions is not yet fully understood. In light of this, it is absolutely necessary to have an understanding of their current capabilities as well as their potential effect on AML (Demetis, 2018).

Therefore, the primary objective of this research article is to examine technological advancements and legal challenges faced by Pakistan to combat money laundering. This research paper begins with analysing the legal framework of money laundering detection and reporting relating to suspicious transactions. Moreover, this research paper also examines the emergence of new financial technologies to deal with issue of money laundering in context of Pakistan. The three main technologies are in focus including machine learning, artificial intelligence and distributed ledger technology. Furthermore, this article also analyses legal challenges faced by financial institutions such as banks in their use of technology to combat money laundering in Pakistan. Lastly, this research proposes various measures for adoption of new technological advancements to combat money laundering in more effective manner.

2. Legal Framework of Money Laundering Detection and Reporting relating to Suspicious Transactions

The main objective of AML procedure is to detect and prevent any suspicious activity relating to laundering of money. If there is even the slightest suspicion that a transaction may include money laundering or the support of terrorist organisations, regulated entities are obligated to notify it to the financial intelligence unit (FIU) under Recommendation 20 of the FATF. In addition, recommendation 29 suggests governments set up the FIU as a national centre to deal with the established money laundering and terrorist funding issues. Hence, the FIU's main job is to gather Suspicious Transaction Reports (STR) data, analyses it, and share it with the appropriate law enforcement organisations (Bartolozzi, Gara, Marchetti, & Masciandaro, 2022). Many of the most important international mechanisms created to combat transnational organised crime, most notably ML/TF, support the creation of the FIU. FIUs are emphasised in both the Palermo Convention (7(1)(b)) and the United Nations Convention Against Corruption (14(1)(b)) to facilitate international collaboration in the exchange of financial intelligence. The EG has been given permission by the FATF to function as an observer and coordinator to improve the quality of mutual assistance between national FIUs.

Moreover, the Anti-Money Laundering Act of (2010) covers "Financial Institutions" (FIs) as well as "Non-Financial Businesses and Professions" (NFBPs). Furthermore, regulations published by the Securities and Exchange Commission of Pakistan (SECP) apply to SECP regulated companies. SECP has also produced AML Guidelines for Non-Profit Organizations and Guidelines for Application of AML Framework under the AML Regulations 2018. Furthermore, the State Bank of Pakistan (SBP) has published AML instructions for the banking industry.

In addition, the regulations governing reporting of STRs in Schedule to AML Act, 2010 provide that STRs shall always be notified whenever there is an indication of the connected crimes. STR must be sent to FMU by any practicing firm that is a reporting organisation under the AML Act. Every suspicious person detected under suspicious transaction report must have their NTN and CNIC verified at Federal Board site and correctly registered in the STR. The statues of the person suspected as the active taxpayer on the FBR portal must also be checked and record must be entered under STR. Furthermore, the amount of tax paid by such person must also be part of the suspicious transaction report (Sultan & Mohamed, 2022).

Nonetheless, Pakistan's overall performance in combating money laundering remained inadequate, leading to the country's placement on the grey list in 2018. At its first mutual evaluation in 2009, Pakistan was found to be partially compliant with R-26, and it was found to be similarly partially compliant with R-29 of the most current FATF recommendation in 2019. Pakistan has been trying to join the Egmont Group of intelligence Units (EG) since the FMU was established in 2007. To yet, however, Pakistan's application for membership in the FMU has been unsuccessful. It's mostly due to a lack of operational experience, a lack of administrative power, and inept upper-level management (Jaffery & Mughal, 2020).

3. Emergence of New Financial Technologies to Combat Money Laundering

In the world we live in today, the state of technology is perpetually advancing, and these advancements are certainly for the better. Leaving scope for manual activities invites a number of unfavourable situations, some of which might lead to irreversible qualitative as well as quantitative damage since the financial institutions are more prone to risks. Criminals are now seeking for innovative new ways to commit crimes as a result of the proliferation of new technologies and the digitalization of formerly analogue processes. As a result of the surge in

financial crimes, institutions now have an even greater need to conform to regulations and invest in proper technologies.

3.1. Machine Learning

In order to combat both the problem of money laundering and the rivalry that exists between the various financial sectors, financial institutions have created more technologically advanced weaponry. As a result, these organisations have set their sights on effectively combating a variety of financial crimes by utilising cutting-edge analytical technologies such as machine learning. Financial institutions also have to deal with criminals and authorities who are applying harsher penalties for violations. Banks are more committed than ever to stopping money laundering and the funding of terrorism AML because they fear supervisor sanctions and harm to their image (Canhoto, 2021).

Machine learning has becoming more popular because of its capacity to sift through large amounts of data in search of indicators of fraudulent financial behaviour. It's defined as a branch of AI and CS that mimics human learning via the use of data and algorithms, become smarter and more useful over time with no human instruction. As it uses deductive reasoning, machine learning is superior to the conventional approaches to combating money laundering that rely on predetermined rules. Machine learning may help combat money laundering in several ways, including the examination of transaction records. Machine learning algorithms can be trained to identify patterns of financial transactions that are consistent with money laundering activity, such as large cash deposits or transfers between accounts in different countries. By flagging suspicious transactions, financial institutions can investigate potential instances of money laundering and take appropriate action (Tai & Kan, 2019).

Another way that machine learning can be used is by monitoring customer behavior. By analyzing customer data and transaction history, machine learning algorithms can identify patterns that deviate from normal behavior, such as sudden changes in transaction amounts or frequency, or unusual transactions for a particular customer (Pettersson Ruiz & Angelis, 2022). These anomalies can be flagged for further investigation to determine whether they are indicative of money laundering activity. The European Banking Authority (EBA) has published research on critical elements in the production, usage, and adoption of advanced analytics methods, such as machine learning in the year 2020. These techniques deal with large amounts of data. Rules-based systems are still extensively used, although they have been proved to be erroneous and ineffectual when it comes to spotting instances of financial fraud. In 2020 alone, penalties against FIs and other necessary organisations will amount $10.6 billion, making this point quite evident (Domashova & Mikhailina, 2021).

However, it is important to note that machine learning algorithms are not infallible and can sometimes generate false positives or false negatives. Therefore, it is important to use human expertise in combination with machine learning to ensure that potential cases of money laundering are thoroughly investigated and verified. Additionally, there are legal and ethical concerns that must be addressed when using machine learning in the fight against money laundering, such as data privacy and bias in algorithmic decision-making (Lokanan & Maddhesia, 2023).

This research proposes that the time has come for Pakistani financial institutions to use machine learning models. Despite this opportunity, increased information and applications of machine learning have raised questions over the efficacy of these techniques and the degree to which machine learning can be trusted and ultimately replace the function of human analysis and decision-making. In order to fully realise the potential of machine learning, financial institutions need to continue to improve their knowledge of the benefits, risks, and constraints associated with this technology. The most essential thing that they need to do is to build an ethical framework for the development and implementation of machine learning. This will allow the viability and effect of machine learning to be confirmed, which will eventually lead to confidence in its applications.

3.2. Artificial Intelligence

Artificial intelligence (AI) is a term used to describe the process through which computers, mostly computer systems, can replicate the intellectual functions of humans. Expert systems,

natural language processing, speech recognition, and object identification are just a handful of the specific uses of artificial intelligence. AI is the ability of machines to learn and reason, in contrast to the natural intelligence displayed by humans and other animals. There are many applications of this, including voice recognition, machine vision, language translation, and input mappings of varying complexity (Han, Huang, Liu, & Towey, 2020). AI can be a powerful tool in the fight against money laundering. Money laundering is a complex and constantly evolving problem, and traditional rule-based systems may not be effective in detecting sophisticated laundering schemes. AI can help financial institutions identify suspicious patterns of behavior that may be indicative of money laundering activities. According to the findings of a research conducted by Europol, the relevant authorities investigate just 10% of the suspicious transaction notices that are received by companies that provide financial services (Singh & Lin, 2021).

In common operational hotspots like customer due diligence, screening, and transaction monitoring controls, AI may significantly increase efficiency. As an instance, existing AML transaction monitoring measures frequently produce a large number of false positive alerts and a substantial operational effort. Inefficiencies in the investigation process further exacerbate the cost issue by considerably altering the link between the amount of work that is expended and the degree to which transaction monitoring procedures are successful (Chitimira, 2020). One of the most important applications of AI that might help identify instances of money laundering is the detection of anomalies. A large amount of transaction data may be examined by AI algorithms, which can then identify strange patterns of behaviour that may be tied to money laundering. For example, AI can identify transactions that are inconsistent with a customer's usual transaction history, or transactions that involve high-risk countries or individuals (Wronka, 2022).

Moreover, AI can also be used for customer profiling, which involves analyzing a customer's transaction history to identify patterns of behavior that may be indicative of money laundering. AI can identify unusual transaction patterns or identify customers who have a high risk of being involved in money laundering activities. Furthermore, AI can help with data analysis and decision-making, making the process of detecting and preventing money laundering more efficient and accurate. For example, AI can help financial institutions identify patterns across multiple customers or transactions, which may be difficult or impossible to identify manually (Canhoto, 2021).

One's deeper comprehension of the ways in which AI may be applied to and combined with human behaviour is giving rise to novel concepts in the field of AML. It opens up opportunities that might lead to a significant shift in the way you interact with and get to Know Your Customer (KYC). It's feasible that the next wave of revolution may result in a tighter integration of the processes that are engaged in risk analysis, supervision, detective reporting, and due diligence. There is a good chance that AI will play a part in this by assisting in the destruction of silos and providing a better contextual foundation for evaluating risk and identifying suspicious behaviour. AI may in the future increase the depth, volume, and frequency of comprehensive KYC checks, as well as better integrate continuous screening and monitoring analytics, according to this potential future scenario (Lee, 2020).

In Pakistan, the State Bank of Pakistan has developed Prudential Regulation (PR) XI: Know Your Customer (KYC). The current instructions that are issued via PR XI need to be further strengthened in accordance with international best practices in order to reinforce the checks and controls that banks have already established and to ensure that due diligence is performed when beginning a relationship with a new customer as well as when maintaining and continuing a relationship with an existing customer. It requires from Banks to get some key documents regarding the identity of a person such as Identity card, service card, or any proof that he or she is serving somewhere, in case of partnership, the partnership deed and registration certificate and in case of a corporation, the memorandum of association, certificate of incorporation and commencement of business are required. These all documents help the banks to establish the true identity of a customer. However, all this process is done manually by the staff of a bank (Khan & Ahmad, 2017).

This paper argues that AI can be a valuable tool for banks in Pakistan to fight against money laundering, helping financial institutions detect and prevent illicit activities more effectively and efficiently. However, it's important to note that AI is not an only option available

and should be used in conjunction with other methods and processes to combat money laundering effectively.

3.3. Distributed Ledger Technology

This technology functions as a distributed ledger that records every transaction that has ever been carried out and displays it. This ledger entry for Bitcoin's blockchain is simultaneously made accessible to the general public and stored on thousands of computers, also known as "nodes," located in different parts of the world. Each new Bitcoin transaction is represented by the addition of a new "block" to the "chain," which is then reflected on the global ledger that each node is a part of. Although it may seem paradoxical, the blockchain is extremely reliable and secure since each node always reflects the same ledger at the same moment. This results in a "consensus mechanism," wherein all of the nodes must reach a unanimous decision over how to record each transaction in the blockchain. Because of this, the blockchain is rendered nearly immune to tampering and transformed into a trustworthy public source that is able to confirm each transaction by the sheer weight of the consensus of thousands upon thousands of computers (Karasek-Wojciechowicz, 2021).

Although cryptocurrencies are not recognised in Pakistan and the country does not have any laws pertaining to the topic, the "Guide on Virtual Assets and Service Providers" published by the FATF in will serve as the basis for the cryptocurrency laws that will be enacted in Pakistan. According to study that attempted to quantify the scope of money laundering through the use of cryptocurrencies, a sample of the Ethereum Network had 4681 accounts, and it was determined that 2179 of those accounts were fraudulent. There was a total of 274 instances of fraud discovered among the 1393 Initial Coin Offerings (ICOs) that were investigated. On the other hand, Bitcoin indicates that it is a reliable anti-money laundering device by the fact that only USD 10 billion out of a market that is $500 billion is utilised in fraud and other criminal activities (Ibrahim, 2019).

One of the main benefits of Distributed Ledger technology (DLT) for financial institution in Pakistan is that it provides a decentralized and transparent ledger that can be accessed and verified by multiple parties. This means that all participants in a transaction can see and verify the same information, making it more difficult to hide illicit activity. Furthermore, DLT provides an immutable and tamper-proof record of all transactions, making it difficult to falsify or alter records. DLT can also help prevent money laundering by increasing the speed and efficiency of transactions. By automating the verification process and reducing the need for intermediaries, DLT can reduce the time and cost associated with verifying transactions, making it more difficult for money launderers to conceal their activities (N. Ali, 2022). In addition, DLT can help prevent money laundering by providing a more secure and trustworthy method for conducting financial transactions. By removing intermediaries and utilizing encryption, DLT can reduce the risk of fraudulent activity and hacking, making it more difficult for money launderers to exploit vulnerabilities in the financial system (Afzal & Asif, 2019).

In Pakistan, ensuring the AML compliance is very expensive for financial institutions. As a result of the significant costs associated with traditional compliance, financial institutions are looking at the possibility of using blockchain technology, in particular an online ledger, as a viable alternative to the traditional method. Blockchain technology didn't make its debut as the open ledger used to monitor Bitcoin transactions until 2009. Prior to that year, it was known as distributed ledger technology. Because Bitcoins are digital currency that are exchanged directly between users (peer-to-peer), there has to be a system to authenticate transactions between Bitcoin accounts. This is essential for the purpose of avoiding the same Bitcoin from being "spent" more than once by the same people. As Bitcoin was created as a way to transact monetary value outside of the traditional financial system and without the intervention of a bank or other reliable third party, a novel approach was devised to tackle the problems of double spending and verification. This technical development was exemplified by the blockchain ledger. The blockchain would function as a distributed ledger to record all transactions, taking the role of the previously necessary reliable third party. It could verify past transactions and provide the balance of Bitcoins associated with each user's wallet (A. Ali, Khan, & Ali, 2021).

This research paper recommends that the financial institutions such as banks should adopt DLT in order to reduce costs associated with AML compliance. Furthermore, law makers

in Pakistan should enact a legislation in order to regulate the use of DLT by financial institutions. Pakistan receives on a regular basis from the FATF a variety of suggestions, distributions, reports, and studies that ultimately lead to guidelines that are eventually adopted by the public. In this regard, we may be able to forecast the path that Pakistan's deployment of virtual currency would go owing to the data that FATF publications and reports have provided with us. The threats and hazards that are linked with digital currencies will be mitigated by adequate legislation and the establishment of awareness programs.

4. Legal Challenges for Financial Institutions relating to Use of Technology to Combat Money Laundering

4.1. Legal Challenges

The use of technology to combat money laundering presents several legal challenges that need to be addressed to ensure compliance with regulations and protect the privacy of individuals.

4.1.1. Privacy of Persoanl Data

In order to combat money laundering through the use of technology, one of the steps involved is the collection and examination of personal data. Financial institutions have a responsibility to ensure that they comply with data protection legislation and preserve the privacy of their customers. The Banking Companies Ordinance of 1962 is the cornerstone of Pakistan's bank secrecy law. This ordinance was enacted in order to ensure that financial institutions respected the privacy of their customers' financial information. The law stipulates that banks must maintain confidentiality of their customers' financial affairs and prohibits the disclosure of any such information without the customer's consent, except as required by law. While bank secrecy laws are intended to protect the privacy of customers, they can also have some drawbacks (Mushtaque, Ahsan, Nadeem, & Umer, 2014). Moreover, Electronic Crimes Act, 2016 is a primary law that deals with the digital privacy of the individuals. This law provides for the protection of personal data, including data relating to financial transactions, and criminalizes unauthorized access, tampering, and interception of such data. The Act also imposes penalties for the misuse of personal data, including fines and imprisonment.

In contrast, the European Union (EU) has just enacted some substantial regulations (officially known as the GDPR) addressing the collection, storage, and use of private details, which became enforceable throughout the EU in May 2018, replacing the EU's 1995 Data Protection Directive (DPD). For the avoidance of doubt, the new law covers any and all sectors, any and all EU institutions, and any and all businesses that handle the personal data of EU citizens. Issues such as data ownership, openness, explainability, and confidence in algorithms trained or constructed utilising this data are brought to the forefront by data-driven regulations. Data-driven automated systems, such as AML systems, must adapt the following during implementation in order to be compliant with the General Data Protection Regulation (GDPR): (1) legal processing of data and information ownership; (2) interpretative structures for the data and techniques; and (3) moral adherence (Goddard, 2017).

The researcher observes that in contrast to the General Data Protection Regulation (GDPR) that was passed in the European Union, Pakistan does not have an all-encompassing data protection regulation at this time. Despite this, there are now a number of proposals being considered for the creation of such a legislation. The Personal Data Protection Law was enacted by the government of Pakistan in the year 2020 with the intention of exercising control over the manner in which individuals, corporations, and the government manage personal data. The law lays forth criteria for businesses that handle personal data and offers individuals particular rights, including the opportunity to view, modify, and delete their personal information. The obligations for organisations that process personal data are outlined in the Act. If passed, this bill would provide a framework for protecting the privacy and personal data of individuals in Pakistan, and would bring the country more in line with international data protection standards, including the GDPR. Therefore, it is true that Pakistan needs a law like GDPR to protect the privacy and personal data of its citizens, and the government is taking steps towards achieving this goal.

4.1.2. Legal Compliance

Pakistan has passed several laws and increased its security measures to counter terrorism funding (CTF) and the laundering of illegal cash. In order to stop terrorism funding and other financial crimes, financial institutions in Pakistan must adhere to AML and CFT rules.

Financial institutions are required to develop their own internal AML/CFT policies, processes, and controls in order to achieve legal compliance. It is necessary to establish these guidelines in order to recognise and report suspicious transactions, as well as to recognise and put a halt to money laundering and operations that fuel terrorist organisations (Asif, Javed, & Hussain, 2021).

Financial institutions' adherence to AML/CFT legislation is monitored by the State Bank of Pakistan (SBP). To guarantee that banks and other financial institutions are in line with AML/CFT regulations, the SBP publishes directives and circulars. Moreover, the SBP conducts on-site inspections at financial institutions to evaluate the effectiveness of AML/CFT systems and guarantee regulatory compliance. The Securities and Exchange Commission of Pakistan (SECP) works in collaboration with the State Bank of Pakistan (SBP) to enforce AML/CFT rules in the country's increasing securities market. The SECP has issued a variety of laws and guidelines to ensure that market participants (including securities dealers, dealers, and others) comply with the AML/CFT standards (Asif et al., 2021).

Despite the efforts made by the government and regulatory bodies, AML/CFT compliance remains a challenge for financial institutions in Pakistan. Money laundering and terrorism financing are difficult to detect and halt in the country due to the prevalence of cash transactions and the widespread usage of the informal economy. Nonetheless, steps are being taken to address these issues and enhance the effectiveness of AML/CFT rules in every state. Compliance with AML regulations at financial institutions is becoming increasingly reliant on the utilisation of technology. In order to be in compliance with AML rules, financial institutions need to monitor transactions and identify suspicious behaviour. This can be a challenging task if the institutions do not have access to the appropriate technology. The use of technology can help automate AML compliance processes, improve efficiency, and reduce the risk of human error (Dupuis & Gleason, 2020).

One of the most important advancements in technology that has helped financial institutions improve their AML compliance is the use of AI and machine learning. These technologies are able to analyse massive volumes of data and recognise patterns that may indicate the presence of criminal behaviour. AI and ML, for example, might be used to recognise unusual transaction patterns or to recognise variations in customer behaviour, both of which could be indications of money laundering or financing for terrorist organisations. Financial institutions can also use technology to perform KYC and customer due diligence checks (Turner, 2011). For example, they can use software to verify customer identities and screen them against watchlists and sanction lists. These checks can help financial institutions ensure that they are not doing business with individuals or entities that are associated with money laundering or terrorist financing activities (Turki et al., 2020).

This study recommends that technology can help financial institutions improve AML compliance by automating processes, improving efficiency, reducing the risk of human error, and enabling the analysis of large volumes of data. AI, ML, KYC/CDD checks, and blockchain technology are just a few examples of how technology can be used to enhance AML compliance. As financial crimes become more sophisticated, the use of technology will likely become even more important for AML compliance. The use of technology must be in line with regulatory requirements to avoid legal and regulatory sanctions.

4.1.3. AML Vendors Leveraging Advanced Analytics to Drive Investigator-Centric Approach

AML Technologies are powered by AI, machine learning, and advanced analytics to provide better support for forensics teams. Institutions may stay ahead of criminals by using faster and more accurate results from specific transactions, filtration, and detection of laundering transactions. Using AI and machine learning, AMLsoftware streamlines and automates procedures like KYC and CDD, as well as the analysis of a massive amount of customer data. It is now much easier to anticipate and identify fraudulent behaviours and to track the source of money laundering activities due to improved consumer behaviour analytics and technologies like network analytics. This is accomplished by analysing changes in consumer data and consumer behaviour. Moreover, innovations in technology, such as network analytics, improve the efficiency of current methods and arguments for detecting fraud. Furthermore, these cutting-

edge tools improves both investigative procedures as well as AML reporting mechnisms (Demetis, 2010).

Because of these factors, businesses such as banks, capital markets, and other financial institutions, retail, e-commerce, and public sector organisations are required to implement anti-money-laundering programmes. These programmes use a combination of manual investigations and technological frameworks to keep tabs on transactions, clients, and their networks in order to identify suspicious activity. The increased digitalization of financial transactions makes it harder for manual investigators to function at a greater scale, nevertheless. So, for intelligent alert prioritisation, advanced analysis, outlier detection, risk measurement rating, trade transaction cycle of life, and correct regulatory compliance, these firms must employ effective AML systems that make use of data and analytics (Parra Moyano & Ross, 2017).

5.   Conclusion and Recommendations

To conclude, laundering illicit funds is a pervasive problem that undermines the integrity of the legal system and places the safety of the financial system in jeopardy. It is a challenge for law enforcement agencies and financial institutions to identify and prevent money laundering activities due to the sophisticated and ever-evolving nature of these activities. However, the use of technology has brought new opportunities to combat money laundering effectively. The way financial institutions identify and stop money laundering operations may change as a result of the use of technology in the fight against it. The efficiency of anti-money laundering activities may be greatly increased by utilising AI, blockchain technology, big data analytics, KYC technologies, and a risk-based strategy. The collaboration among financial institutions, regulatory authorities, and law enforcement agencies is also essential to combat money laundering effectively. However, financial institutions must address legal and technical challenges to ensure the effectiveness of technology to combat money laundering.

The prevention of money laundering in Pakistan could be accomplished via the use of technology in a variety of different ways. As a result, the application of technology may be able to make a substantial contribution to the fight against money laundering in Pakistan by encouraging a greater level of collaboration among a wide variety of stakeholders, enhancing data analysis, and increasing transparency. Combating financial crimes is becoming simpler and less expensive due to AI, and machine learning. In addition, it has inspired financial institutions to adopt novel and fruitful strategies. The effectiveness of these programmes in detecting anomalies is expected to be high. Procedures that are dependent on physical labour typically move at a snail's pace. Nevertheless, thanks to advancements in automation and AI, these processes are now far more efficient and time-saving than in the past. In addition, there is a less chance for manipulation or error on the part of a person. There is a lot of information that has to be managed at financial institutions. Suppose now that actual humans had to go through this mountain of information, analyse it, and draw conclusions. That would take forever and yet not ensure complete reliability and correctness.

If the same process is carried out by software that is swift, accurate, and efficient, you may save money and valuable time. AML compliance professionals are now able to devote more time to in-depth analysis, coordination with other financial institutions, and root-cause investigation since artificial intelligence can swiftly discover trends in transactions, irregularities, and behaviour. and invaluable amounts of time. The usage of technology extends well beyond that of merely tracking transactions. With the advent of big data, it's become possible to discover patterns in the mountains of data, allowing corporations to expand their financial crime monitoring beyond the transaction level. This facilitates and expedites the process by which the company may trace the origins of any illegal dealings or conduct. AI is transforming the way financial institutions detect and prevent money laundering. AI can analyze vast amounts of data in real-time and identify patterns that indicate suspicious activities. Machine learning algorithms can learn from historical data to improve the accuracy of identifying suspicious activities and reduce false positives. AI can also enhance customer due diligence by providing an accurate assessment of customer risk. Similarly, blockchain technology is a distributed ledger that records transactions securely and transparently. It can be used to track transactions and identify suspicious activities in real-time. Blockchain technology is also used to share data among financial institutions, law enforcement agencies, and regulatory authorities, enabling them to collaborate effectively in the fight against money laundering. The volume and complexity of data generated by financial institutions make it challenging to detect money laundering activities.

Technology has the potential to greatly aid in the fight against money laundering. More and more financial institutions are abandoning the traditional black-and-white approach to rules in favour of a strategy that is more technology-focused, comprehensive, and adaptive. It can analyze vast amounts of data in real-time, identify patterns that indicate suspicious activities, and enable financial institutions to take appropriate action promptly. Collaboration among financial institutions, regulatory authorities, and law enforcement agencies can also significantly improve the effectiveness of anti-money laundering efforts. However, there are legal and technical challenges that need to be addressed to ensure the effectiveness of technology to combat money laundering.

References

Afzal, A., & Asif, A. (2019). Cryptocurrencies, blockchain and regulation: A review. *The Lahore Journal of Economics, 24*(1), 103-130.

Ali, A., Khan, A. S., & Ali, A. M. (2021). Cryptocurrencies and Money Laundering: Methodologies, Prospect and Proposed Legislation for their Prevention in Pakistan. *Research Journal of Social Sciences and Economics Review, 2*(3), 170-177.

Ali, N. (2022). To Regulate the Cryptocurrencies in Pakistan: Demand of Time. *Online Media and Society, 3*, 160-170.

Anti-Money Laundering Act of , A. (2010). *Anti-Money Laundering Act, 2010, Act No. VII of 2010*. Retrieved from https://www.fmu.gov.pk/docs/Anti-Money-Laundering-Act-2010-amended-upto-Sep.%202020.pdf

Asif, M., Javed, Y., & Hussain, M. (2021). *Automated Analysis of Pakistani Websites' Compliance with GDPR and Pakistan Data Protection Act.* Paper presented at the 2021 International Conference on Frontiers of Information Technology (FIT).

Bartolozzi, D., Gara, M., Marchetti, D. J., & Masciandaro, D. (2022). Designing the anti-money laundering supervisor: The governance of the financial intelligence units. *International Review of Economics & Finance, 80*, 1093-1109. doi:https://doi.org/10.1016/j.iref.2022.03.009

Canhoto, A. I. (2021). Leveraging machine learning in the global fight against money laundering and terrorism financing: An affordances perspective. *Journal of business research, 131*, 441-452. doi:https://doi.org/10.1016/j.jbusres.2020.10.012

Chitimira, H. (2020). The reliance on artificial intelligence measures to curb money laundering practices in the South African banking institutions and real estate sector. *Acta Universitatis Danubius. Juridica, 16*(2), 28-43.

Demetis, D. S. (2010). *Technology and anti-money laundering: A systems theory and risk-based approach*: Edward Elgar Publishing.

Demetis, D. S. (2018). Fighting money laundering with technology: A case study of Bank X in the UK. *Decision Support Systems, 105*, 96-107. doi:https://doi.org/10.1016/j.dss.2017.11.005

Domashova, J., & Mikhailina, N. (2021). Usage of machine learning methods for early detection of money laundering schemes. *Procedia Computer Science, 190*, 184-192. doi:https://doi.org/10.1016/j.procs.2021.06.033

Dupuis, D., & Gleason, K. (2020). Money laundering with cryptocurrency: open doors and the regulatory dialectic. *Journal of Financial Crime*. doi:https://doi.org/10.1108/JFC-06-2020-0113

Han, J., Huang, Y., Liu, S., & Towey, K. (2020). Artificial intelligence for anti-money laundering: a review and extension. *Digital Finance, 2*(3-4), 211-239. doi:https://doi.org/10.1007/s42521-020-00023-1

Ibrahim, S. A. (2019). Regulating cryptocurrencies to combat terrorism-financing and money laundering. *Stratagem, 2*(1).

Jaffery, I. H., & Mughal, R. A. L. (2020). Money-laundering risk and preventive measures in Pakistan. *Journal of Money Laundering Control, 23*(3), 699-714. doi:https://doi.org/10.1108/JMLC-02-2020-0016

Jullum, M., Løland, A., Huseby, R. B., Ånonsen, G., & Lorentzen, J. (2020). Detecting money laundering transactions with machine learning. *Journal of Money Laundering Control, 23*(1), 173-186. doi:https://doi.org/10.1108/JMLC-07-2019-0055

Karasek-Wojciechowicz, I. (2021). Reconciliation of anti-money laundering instruments and European data protection requirements in permissionless blockchain spaces. *Journal of Cybersecurity, 7*(1), tyab004. doi:https://doi.org8/10.1093/cybsec/tyab004

Khan, I., & Ahmad, A. (2017). Assessing Banks Internal Factors as Determinants of Non-Performing Loans: Evidence from Pakistani Commercial Banks. *Journal of Managerial Sciences, 11*(1).

Korejo, M. S., Rajamanickam, R., & Md. Said, M. H. (2021). The concept of money laundering: a quest for legal definition. *Journal of Money Laundering Control, 24*(4), 725-736. doi:https://doi.org/10.1108/JMLC-05-2020-0045

Kumar, V. A. (2012). Money laundering: Concept, significance and its impact. *European Journal of Business and Management, 4*(2).

Lee, J. (2020). Access to finance for artificial intelligence regulation in the financial services industry. *European Business Organization Law Review, 21*, 731-757. doi:https://doi.org/10.1007/s40804-020-00200-0

Lokanan, M., & Maddhesia, V. (2023). Predicting Suspicious Money Laundering Transactions using Machine Learning Algorithms. doi:https://doi.org/10.21203/rs.3.rs-2530874/v1

Mekpor, E. S., Aboagye, A., & Welbeck, J. (2018). The determinants of anti-money laundering compliance among the Financial Action Task Force (FATF) member states. *Journal of Financial Regulation and Compliance*. doi:https://doi.org/10.1108/JFRC-11-2017-0103

Mushtaque, K., Ahsan, K., Nadeem, A., & Umer, A. (2014). Critical Analysis for Data Privacy Protection in Context of Cyber Laws in Pakistan. *Journal of Basic and Applied Scientific Research, 4*(10), 1-4.

Naheem, M. A. (2019). Exploring the links between AML, digital currencies and blockchain technology. *Journal of Money Laundering Control*. doi:https://doi.org/10.1108/JMLC-11-2015-0050

Parra Moyano, J., & Ross, O. (2017). KYC optimization using distributed ledger technology. *Business & Information Systems Engineering, 59*, 411-423. doi:https://doi.org/10.1007/s12599-017-0504-2

Pettersson Ruiz, E., & Angelis, J. (2022). Combating money laundering with machine learning– applicability of supervised-learning algorithms at cryptocurrency exchanges. *Journal of Money Laundering Control, 25*(4), 766-778. doi:https://doi.org/10.1108/JMLC-09-2021-0106

Ramos, M. A., & Ashby, N. J. (2013). Heterogeneous firm response to organized crime: Evidence from FDI in Mexico. *Journal of International Management, 19*(2), 176-194. doi:https://doi.org/10.1016/j.intman.2013.01.002

Singh, C., & Lin, W. (2021). Can artificial intelligence, RegTech and CharityTech provide effective solutions for anti-money laundering and counter-terror financing initiatives in charitable fundraising. *Journal of Money Laundering Control, 24*(3), 464-482. doi:https://doi.org/10.1108/JMLC-09-2020-0100

Sultan, N., & Mohamed, N. (2022). Financial intelligence unit of Pakistan: an evaluation of its performance and role in combating money laundering and terrorist financing. *Journal of Money Laundering Control*(ahead-of-print). doi:https://doi.org/10.1108/JMLC-04-2022-0060

Tai, C.-H., & Kan, T.-J. (2019). *Identifying money laundering accounts.* Paper presented at the 2019 International Conference on System Science and Engineering (ICSSE).

Turki, M., Hamdan, A., Cummings, R. T., Sarea, A., Karolak, M., & Anasweh, M. (2020). The regulatory technology "RegTech" and money laundering prevention in Islamic and conventional banking industry. *Heliyon, 6*(10), e04949. doi:https://doi.org/10.1016/j.heliyon.2020.e04949

Turner, J. E. (2011). *Money laundering prevention: Deterring, detecting, and resolving financial fraud*: John Wiley & Sons.

United Nations Office on Drugs and Crime, U. (2011). *United Nations Office on Drugs and Crime (UNODC)*. Retrieved from https://www.dfat.gov.au/sites/default/files/unodc-assessment.pdf

Uroos, A., Shabbir, M. S., Zahid, M. U., Yahya, G., & Abbasi, B. A. (2022). Economic analysis of corruption: evidence from Pakistan. *Transnational Corporations Review, 14*(1), 46-61. doi:https://doi.org/10.1080/19186444.2021.1917331

Wronka, C. (2022). "Cyber-laundering": the change of money laundering in the digital age. *Journal of Money Laundering Control, 25*(2), 330-344. doi:https://doi.org/10.1108/JMLC-04-2021-0035