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BLOCKCHAIN ADOPTION IN FAMILY TAKAFUL: OPPORTUNITIES, CHALLENGES, AND POLICY IMPLICATIONS FOR PAKISTAN

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Abstract

The family takaful sector in Pakistan faces challenges in regulatory compliance, payment efficiency, fraud prevention, and transparency. Blockchain technology, which is decentralised and transparent, could address these issues. This study assesses blockchain's feasibility and impact in Pakistan's takaful sector, using a Systematic Literature Review (SLR) and case studies from Malaysia, the UAE, and Indonesia. Findings suggest blockchain can streamline operations by automating premium collection and claims through smart contracts, reducing costs and fraud. In Malaysia and the UAE, the success of using blockchain in Islamic finance highlights potential efficiency and security benefits. However, Pakistan's adoption faces regulatory ambiguity, lack of Shariah-compliant frameworks, limited expertise, and low industry readiness. Overcoming these can lead to sustainable growth in Pakistan's digital finance sector. Policymakers need to create regulatory sandboxes and Shariah-compliant smart contracts. Takaful operators should pilot projects on claims automation and fraud prevention and increase consumer awareness to boost confidence. Blockchain could enhance trust, efficiency, and inclusion in line with global digital trends.

Keywords: Blockchain, Family Takaful, Islamic Finance, Smart Contracts, Digital Payments Systems, Fraud Prevention, Pakistan's Regulatory Challenges

1. Introduction

Operating on mutual respect, shared responsibility, and ethical risk-sharing, family takaful is an Islamic substitute for traditional life insurance. A key component of the Islamic financial sector, it has become very popular in Pakistan thanks to growing customer taste for financial solutions consistent with religious values. The industry nevertheless has significant operational difficulties notwithstanding this expansion, especially in payment processing. Often ineffective, prone to fraud, and without the openness required to build policyholders' confidence, conventional digital payment systems These restrictions impede the smooth handling of Takaful donations and claims, therefore causing inefficiencies impacting operators as well as participants. These structural problems call for technical developments that may improve Family Takaful operations' efficiency, security, and openness.

Offering a distributed, unchangeable, transparent foundation for financial transactions, blockchain technology has become more popular as a possible answer to problems. Blockchain is a convincing way to improve the efficiency of Takaful systems as it removes intermediaries, thus simplifying payment processing, lowering administrative expenses, and reducing fraud risks. Jurisdictions such as Malaysia and the UAE, where blockchain-based smart contracts and distributed ledger technologies have been included in Takaful claim administration and financial transactions, have previously investigated its applicability in the more

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significant Islamic financial industry. These international events imply that blockchain can revolutionise Takaful operations in Pakistan by utilising it. Nonetheless, the effective use of blockchain in Takaful depends on a thorough awareness of several contextual elements, including market readiness, technological viability, and regulatory issues. Adoption chain in Islamic finance is not without difficulties, as regulatory ambiguity, Shariah principle compliance, and data security issues remain primary obstacles to general application.

The potential of blockchain technology in improving the efficiency, security, and fraud prevention systems of Family Takaful in Pakistan is systematically reviewed in this work. The paper assesses how blockchain may solve legal and financial obstacles, increase payment efficiency, and provide a reasonable substitute for traditional digital payment systems by aggregating current research and looking at case studies from both Western and regional settings. The report also looks at sensible implementation strategies and policy suggestions to help Pakistan's Takaful sector to integrate blockchain technologies. Given the fast development of financial technology, this review offers insightful analysis for legislators, financial institutions, and Takaful operators trying to modernise their activities by best practices and guarantee Shariah compliance. Using a Meusel,gf the body of current literature seeks to add to the expanding conversation on Islamic FinTech by pointing out opportunities and issues that need to be resolved to utilise blockchain in the Family Takaful industry comprehensively; the results add to the increasing corpus of information on Islamic FinTech and its implementation in Takaful. Examining real-world case studies and regulatory viewpoints helps this study give insights for Takaful operators trying to modernise payment systems, financial institutions, and legislators. It emphasises legislative suggestions to close legal loopholes and encourage blockchain acceptance in Pakistan's Islamic insurance market. Maintaining competitiveness, building trust, and increasing financial inclusion in keeping with Shariah values depend on Takaful being in sync with technology like blockchain, given the fast change of digital banking.

2. Review of Literature

The literature study examining blockchain applications in Family Takaful payment systems covers efficiency gains, fraud prevention, and regulatory obstacles, contrasting with traditional systems. Emphasising papers released between 2015 and 2024, it focuses on research from Pakistan and related Islamic financial markets (Malaysia, UAE, Indonesia).

Blockchain in Takaful: Offering distributed, open, unchangeable transaction records that fit Shariah's ethical standards, blockchain has become popular in Islamic banking. Much research has examined how blockchain technology may be used in Takaful and how it might increase operational effectiveness. For instance, Zulaikha et al. (2024) presented a distributed Takaful model using blockchain to improve openness and trust; their suggested method employed smart contracts to share risk while closely obeying Islamic norms automatically. Leading in blockchain-enabled Islamic finance are Malaysia and the United Arab Emirates. Zulaikha et al. (2024) underlined how blockchain technology helps Malaysia's Takaful claims handling digitise, lowering processing times and enhancing transactional security. Several Takaful operators (e.g., Aman, Noor Takaful, and Watania) worked with an InsurTech business in the UAE to incorporate a blockchain platform for motor claims; this pilot shortened claim settlement from days to minutes and removed inter-company documentation. These worldwide experiences show how blockchain might simplify insurance procedures and motivate similar developments in Pakistan, where demand for copying such achievements is rising. With an eye towards micro-Takaful and microfinance integration, Indonesia is also investigating blockchain in Islamic banking. Research shows that an unchangeable, shared ledger might speed up micro-insurance claims and payments, enhancing timeliness and openness for grassroots-level participants. For Pakistan's Takaful sector, such global events offer a useful yardstick.

The digital financial scene of Pakistan is changing as the government's interest in fintech and blockchain technologies grows. Although the State Bank of Pakistan (SBP) has announced openness to digital finance and developed quick payment systems (e.g. Raast), regulatory uncertainties and technological constraints mean that blockchain use in Takaful remains embryonic. Examining Pakistan's Islamic financial market, Laldin and Djafri (2019) said blockchain-based smart contracts might simplify premium collecting and claims in Takaful, lowering administrative expenses and delays. Their work on blockchain "smart Sukuk"

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demonstrated how digital ledgers may reduce issuing costs and increase transparency in Islamic financial instruments - ideas applicable to Takaful contributions and rewards. Notwithstanding these benefits, there are few well-defined rules set by authorities. Pakistani organisations like SBP and the Securities and Exchange Commission of Pakistan (SECP) have not yet issued specific instructions on blockchain in Islamic finance. Local Takaful operators have thus been cautious; as of 2024, no significant blockchain-driven Takaful platform functions locally. The lack of specific use cases in Pakistan highlights the requirement for a supporting ecosystem compared to trials in surrounding regions.

Eliminating intermediaries and allowing real-time processing help blockchain technologies promise efficiency in financial transactions. According to Gatteschi et al. (2018), blockchain-based solutions can save operating expenses and transaction times in Islamic financial services. Smart contracts—self-executing agreements on a blockchain—can automatically handle regular tasks such as premium collecting, claims validation, and reward distribution in Takaful. By running predefined policies, they reduce manual involvement and delays, enabling speedier and error-free payments. For a vehicle accident, for example, if a claim event is validated—that is, by an IoT sensor or an oracle—a smart contract may instantly pay the beneficiary without any administrative actions. Since less labour is required to process transactions, this automation speeds up settlements and lowers administrative expenses. Blockchain also improves openness as every transaction is noted on a tamper-proof ledger available to authorised parties. Transparency fosters confidence in Takaful operations, particularly in Pakistan, where faith in insurers is vital, Zulaikha et al. (2024) underlined. Blockchain lets users collect real-time rewards and audit contribution pools, guaranteeing responsibility. More openness helps to correct knowledge asymmetry and ensure policyholders that money is used morally. Research indicates blockchain can simplify Takaful processes, resulting in speedier service and more trust - two crucial elements for Islamic insurance to be scaled.

In Pakistan's financial industry, fraud is an ongoing problem involving Takaful, whereby fraudulent claims, identity theft, or document fabrication could compromise the system. Firm answers to reduce these dangers come from blockchain technologies. On a blockchain, all transactions are encrypted using cryptography and noted on an unchangeable ledger, so they cannot be undone or changed. According to Gatteschi et al. (2018), this immutability stops illegal entries and unauthorised changes, as any effort to alter data will show immediately via the distributed network. This drastically reduces the chances for theft or double-claiming by giving donations and claims one single source of truth. Blockchain also improves identification validation. Blockchain-based digital identification solutions—for example, leveraging distributed ledger technology for KYC—suggested by Grima et al. (2020) can securely authenticate Takaful members. Every policyholder may be issued a distinct digital identity on the blockchain, which would be used for transaction signing; this makes it challenging for fraudsters to pass for clients or submit false claims. Moreover, modern systems combine blockchain with artificial intelligence to identify fraud. Insurance researchers outline scenarios, wherein artificial intelligence algorithms examine blockchain, claims data to identify abnormalities, enabling automated claim verification. For example, a shared blockchain ledger would promptly show a duplicate claim if a policyholder files many claims across several organisations. Reducing human fraud detection helps insurance companies cut running expenses and operational risk. The research generally shows that the security elements of blockchain—decentralisation, encryption, consensus validation—improve fraud prevention and cybersecurity in Takaful systems significantly. This is especially pertinent for Pakistan, where increasing digital fraud has been observed; by practically removing some fraud routes, a safe blockchain platform might boost faith in Islamic insurance.

While blockchain has technological benefits, regulatory ambiguity remains a primary obstacle to its use in Takaful. Shariah compliance challenges Financial authorities in Pakistan have not yet developed a thorough blockchain in finance policy. Examining these legal obstacles, Grima et al. (2020) discovered that policymakers are cautious about data privacy, system interoperability, and verifying Shariah compliance with blockchain applications. One issue is whether automated systems and smart contracts completely coincide with Shariah rules — for example, can they sufficiently address intricacies of riba (interest), gharar

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(uncertainty), and may (gambling) avoidance? Some Islamic academics remain wary, wondering if intricate algorithms may unintentionally go against Shariah rules.

Meanwhile, others contend that blockchain may be made to enforce Shariah principles by programmatically incorporating scholars' advice into smart contractsbrecorder.com. Blockchain's openness and immutability help to guarantee that transactions follow Islamic contracts—that is, without hidden clauses or ex-post adjustments. Another regulatory concern is Pakistan's absence of legislation or rules about cryptocurrencies and digital assets, which are sometimes closely related to the blockchain debate. Early 2024 sees cryptocurrencies not accepted as legal currency in Pakistan; a ban on crypto trading was even suggested in 2023 owing to fraud and AML issues unlocking-bc.com unlock-bc.com. This wary attitude to cryptocurrencies generally clouds blockchain innovation. Using regulatory sandboxes allowing controlled experimentation with fintech, including blockchain, Bank Negara Malaysia and the Securities Commission Malaysia have been proactive, supporting innovation under control rsisinternational.org. Similarly, the UAE's Insurance Authority approved experimental initiatives (such as the Addenda blockchain platform) by offering permissions and a conducive atmosphere for InsurTech businesses. These cases highlight the need for transparency and official backing from authorities. Regulators (SECP and SBP) of Pakistan would have to provide rules defining how blockchain could be used for Takaful in a Shariah-compliant manner (e.g., standards for innovative contract-based policies, consumer protection on distributed platforms, and data privacy compliance). The literature, therefore, draws attention to a paradox. Although blockchain might increase compliance and openness, Takaful operators would be reluctant to use this technology without revised laws and Shariah governance systems.

Several studies directly compare blockchain-based Takaful payment systems with the standard digital payment methods now utilised by insurance companies. While conventional systems gain from known rules and familiarity, the consensus is that blockchain offers clear benefits in efficiency, security, and transparency. Gatteschi et al. (2018) examined blockchain's ability to automate financial transactions relative to traditional banking. The study concluded that blockchain-based payments can significantly lower transaction costs by removing third-party intermediaries and requiring extensive verification, which results in more cost-effective operations. Unlike traditional e-banking, which may have cut-off times or delays, Takaful implies that contribution collecting and claim disbursements via blockchain might incur reduced expenses (no intermediate bank charges) and settle quickly. Similar observations were made by Laldin and Djafri (2019), who said blockchain transactions provide more security and speed than conventional gateways—conversely, solid legal structures and control support Pakistani traditional digital payment systems. Consumers also understand them and are somewhat connected with the financial system. Table 1 offers a cursory comparison:

Table 1

Cursory Comparison

Aspect	Blockchain-Based Takaful Payments	Conventional Digital Payments
Transaction Speed & Cost	Near-instant settlement; minimal fees (no intermediaries).	Often involve intermediaries (banks/gateways), processing delays and fees.
Fraud Prevention	An immutable ledger prevents data tampering and duplicate claims.	Vulnerable to hacking, identity theft, and data manipulation in centralised databases.
Regulatory Clarity	Emerging in Pakistan lacks a clear legal framework.	Long-standing regulations and monitoring by SBP/SECP for electronic transactions.
Transparency	Fully auditable, shared record visible to stakeholders, boosting trust.	Limited visibility; data siloed in company databases, requiring audits to verify.

Blockchain-based solutions satisfy the demands of a trust-based system such as Takaful by outperforming in technical criteria of performance and security, as stated above. However, the absence of

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legislative backing in Pakistan and the novelty of the technology mean traditional systems now have a practical edge. According to the literature, legislators should change rules to fit blockchain, and stakeholders should grow at ease with its application to level this field. For Pakistan's Takaful industry, blockchain's advantages may thus remain primarily theoretical.

3. Methodology

Under the direction of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, this study uses a Systematic Literature Review (SLR) strategy to guarantee a methodical and open procedure. We found, chose, and carefully assessed pertinent material to examine blockchain's effects on Family Takaful payment systems in Pakistan. The approach was meant to pick local subtleties as well as global insights.

3.1. Research Design

The SLR was conducted in several phases: (1) defining straightforward research questions aligned with the objectives; (2) doing a thorough literature search with predefined keywords; (3) applying inclusion/exclusion criteria to filter studies; (4) classifying selected studies by key themes (efficiency, fraud mitigating, regulatory challenges, etc.; and (5) synthesising findings through thematic analysis and comparative assessment. Combining qualitative thematic synthesis with comparative case analysis assures the conclusions are based on high-quality sources (peer-reviewed journals, conference papers, and reputable industry reports).

We searched scholarly and commercial databases, including Google Scholar, IEEE Xplore, SpringerLink, ScienceDirect, Web of Science, and Google Scholar. Since blockchain is a relatively new topic in finance, the search was limited to papers from 2015 to 2024 to catch the most critical and current developments. Using Boolean operators to hone results, we search for combinations of terms such as "Blockchain AND Islamic Finance," "Family Takaful AND Smart Contracts," "Digital Payment Systems AND Pakistan," "Blockchain AND Takaful AND fraud," "Shariah Compliance AND Blockchain," etc., Given blockchain is a relatively new issue in finance. Other sources of regulatory updates included Islamic financial news media and websites of regulatory bodies (SBP, SECP).

Technical and financial literature, including legal/regulatory analysis, was examined; studies from 2015 forward focused on Pakistan or similar Islamic finance markets (Malaysia, UAE, Indonesia); addressed blockchain in Islamic finance, Takaful, or digital insurance transactions; were peer-reviewed or credible whitepapers. Studies unrelated to Takaful or insurance, such as widespread blockchain in non-Islamic environments, were not mentioned. Non-peer-reviewed sources were not included unless explicitly offering industry statistics: deleted repetitions or earlier versions. Out of 150 records, thirty papers underwent PRISMA evaluation, and nine matched all criteria. There is screening involved here. Thirty papers were evaluated for relevance and insight; eighty records were looked at post-filtering for alignment with blockchain and Takaful; and a quality evaluation was conducted using the CASP checklist for credibility and methodology. The remaining studies were only outstanding, clear, data-based peer-reviewed studies.

The PRISMA summary (Table 2) is as follows:

Table 2

PRISMA Flow Diagram

Stage	Number of Studies
Records identified (total)	150
Records after duplicates are removed	120
Records screened (title/abstract)	80
Full-text articles assessed	30
Studies included in the final review	9

3.2. Data Extraction and Thematic Study

Data for every one of the nine included studies were gathered regarding their goals, approaches, significant conclusions, and applicability to our study topics. We arranged findings under topics generated

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from our framework, efficiency improvements, fraud prevention, regulatory issues, and comparative insights (blockchain vs. conventional). Based on some research, more categories, such as macroeconomic background and financial inclusion. Then, we used a qualitative thematic analysis, grouping ideas from several research studies under each subject to spot consensus and differences. For instance, many experiments stressing speedier transactions were combined to evaluate consistency in that result. This themed approach allowed a thorough knowledge of how blockchain affects Family Takaful and helped expose gaps (e.g., if few studies addressed consumer views, that is underlined as an issue for additional research).

3.3. Comparative Case Study Method

We included a comparative case dimension to root the review in practical terms. We looked at documented blockchain implementations, pilot projects, in Takaful/insurance in Malaysia, UAE, and Indonesia that drive Islamic finance markets. These case studies are benchmarks:

- Malaysia: Early acceptance of blockchain in Islamic banking under strong legislative support. For Takaful claims processing using blockchain, for instance, Malaysia's authorities helped to enable a pilot that supposedly drastically reduced claim settlement times. Established in 2016, Malaysia's Fintech Sandbox lets Islamic insurance startups explore blockchain ideas under co. control
- UAE: Insurance-based blockchain projects supported by the government. Thanks to the UAE's "InsurTech Hive" incubator in Dubai, startups like Addenda, working with Takaful operators, have created a live blockchain platform for inter-company vehicle claim exchange. Regulators approved this teamwork, and faster claims recovery resulted from it.
- Indonesia: Takaful and blockchain integration in microfinance compliance with Shariah. Early on, Indonesia views blockchain as a means of scaling micro-Takaful to its vast population by guaranteeing openness and confidence in community insurance pools, ensuring trust.

Results from these examples were matched to the Pakistani setting to evaluate viability. We learn from what worked—or failed—elsewhere how Pakistan should embrace.

Though our study is qualitative, we created a quick statistical overview of the features of the literature. Two-thirds of the nine studies spanning 2016 to 2024 were published in 2019 or later, suggesting that study interest in this issue is very recent and fast-increasing. The coverage was somewhat balanced thematically: on average, one to two studies covered each main issue (efficiency, fraud, etc.), with no one theme dominating. This harmony implies that academics see the effect of blockchain on Takaful as complex. It also suggests that any particular element, e.g., fraud prevention, has just a few focused studies, thereby stressing the need for more thorough investigation in every field. We visualised the research distribution by subject and year (Figure 2 in the appendix offers a breakdown), which reveals an increase in publications around 2020–2024, matching the worldwide fintech growth.

3.4. Ethical Considerations

Secondary data from published works forms the foundation of this study. Direct ethical concerns were low as no human beings or private information were involved. To uphold academic integrity and prevent plagiarism, we have guaranteed appropriate credit and referencing of all the sources. When reading research including human or organisational data, we also considered ethical remarks by the original authors, if informed permission was acquired in each case study, etc., in mind. This cautious treatment of sources maintains the moral requirements of systematic reviews.

The approach generally guarantees a thorough and open evaluation. Combining the SLR method with case-study insights and fundamental trend analysis gives the research a detailed picture of blockchain possibilities in Takaful, catered to Pakistan's situation but informed by world experience.

4. Results and Discussions

Organised by subject categories, the main conclusions of the review are presented in the following sections: efficiency enhancements, fraud reduction, regulatory issues, and comparative perspectives. We next review the ramifications for Pakistan's Takaful industry, combining these results with case study teachings to determine what must be addressed to leverage blockchain technologies properly.

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4.1. Transparency and Efficiency Enhancements

Blockchain's ability to improve transparency, simplify processes, and lower inefficiencies is among its most important benefits for family takaful payment systems. According to the literature, blockchain can automatically and quickly speed up several slow-moving operations in traditional systems:

Blockchain-based smart contracts can help automate the Takaful agreement's performance. Self-executing contracts can be programmed into premium contributions, fee deductions, and claims payouts. Smart contracts, according to Zulaikha et al. (2024), might automatically enforce risk-sharing based on Takaful regulations, therefore guaranteeing that rewards match Islamic values and set criteria. When a claim event (like death in a family Takaful plan) happens, the smart contract will quickly check the policy data and start the payout to beneficiaries without human intervention. This lessens paperwork, delays, and the possibility of human mistakes. Takaful operators may significantly reduce administrative costs by doing away with hand-operated intervention. According to one study, automating claims using smart contracts resulted in faster resolution and higher customer satisfaction in a pilot environment. Unlike the days or weeks under older systems, participants received almost real-time claim approvals, sometimes in minutes.

Traditional Takaful transactions often include several middlemen (agents, banks, clearing systems), therefore incurring delays in payment processing. Through a distributed ledger, all parties trust, blockchain lets real-time, peer-to-peer transactions occur. Using a blockchain ledger for payments cleared congestion and drastically shortened transaction times, according to Gatteschi et al. (2018). In Pakistan, where cross-institution payments or interbank transfers might be delayed, a private or consortium blockchain among banks and Takaful operators could enable rapid transfers to the Takaful fund or claimants. Every transaction block is verified in minutes (or seconds using speedier consensus techniques), therefore offering finality of payment. Since donations update in real-time and may be invested or distributed without delay, this speed improves the client experience and helps liquidity management for Takaful funds. Real-time processing fits the demands of a digital economy; for example, contributions might be made using blockchain mobile wallets, making Takaful more accessible to the younger, tech-savvy populace.

Transparency is vital in Takaful as players want guarantees that money (Cabarrus pools) are handled morally and dividends are fair. Full auditability of blockchain implies that every transaction, contributions in, claims out, operator fees, excess distribution, is noted and accessible to authorised stakeholders. This generates just one source of truth. According to Zulaikha et al. (2024), such openness might boost confidence in Takaful operations. Under a blockchain-based Takaful paradigm, a participant might check in and view the rationale for any rewards made and the past transactions of the risk pool, which may be anonymised for privacy, ensuring that no theft is taking place. An auditable blockchain gives regulators more control; the SECP may be a node on the network tracking real-time compliance issues. This degree of openness is challenging with traditional databases, which are compartmentalised and prone to manipulation. Blockchain may also encourage more consumption of Takaful by building confidence via openness -- particularly among a dubious section of the public owing to prior mismanagement in insurance. People could be more eager to contribute if they know a tamper-proof ledger handles their donations, increasing the Takaful clientele.

More transparency corresponds with an increase in the efficiency of blockchain (automation and speed). The mix can provide a Takaful system with better dependability and responsiveness. These results fit world fintech trends: digital technology is supposed to offer speedier and less expensive financial services. Particularly, blockchain is underlined as a technology that guarantees both speed and trust - a balance that aligns well with the values of Islamic banking, where operational excellence should not sacrifice ethical supervision. However, realising these advantages in Pakistan would depend on overcoming some obstacles covered later (e.g., training workers to oversee smart contracts and interoperability with current systems).

4.2. Security and Deception Reduction

Strong defences against fraud and cyber threats provided by blockchain design help to solve one of the leading insurance pain issues. Essential results on how blockchain improves Takaful security consist of:

Every transaction entered on a blockchain is encrypted using cryptographic hashes and connected to the next block, therefore rendering the ledger unchangeable. Once data is entered (and verified by the network

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nodes), it cannot be changed retroactively without upsetting the network consensus. This is a strong discouragement to fraud. For example, the blockchain would reject a false claim payout or backdated policy contribution as they would not match the hash chain. Gatteschi et al. (2018) underline that this immutability guarantees openness and avoids false record changes. Immutability in a multi-operator environment—say, an industry-wide blockchain for all Takaful firms in Pakistan, means that no one company or administrator can covertly alter the data, thereby encouraging integrity even if some insiders are compromised. It also streamlines audit procedures; auditors may depend on blockchain data as a definitive log, limiting the possibility of fraud usually taken advantage of.

Improved Identity Management: Identity theft or impersonation, someone claiming on another person's policy—is a typical path for insurance fraud. Blockchain-based certificates or distributed identities (DIDs) allow blockchain to include digital identity verification using technologies. Grima et al. (2020) advises policyholders to keep safe digital identities by utilising blockchain technology. Practically, this may mean every Takaful participant has a blockchain address or token that reflects their identity, validated via safe onboarding (maybe via an oracle to link national ID systems). Like submitting a claim, transactions would call for a cryptographic signature from the participant's private key, almost impossible to provide. This would stop illegal claims as only the authentic identity, with the private key, can start certain activities. Blockchain identity solutions may also assist in fighting double-dipping fraud. For instance, a shared blockchain identity and claims history would quickly highlight the duplicate claim if a person has policies with two distinct Takaful operators and attempts to claim from both for the same incident. The background of changing digital ID (such as Nadra's digital projects) in Pakistan might combine with blockchain to provide a strong KYC and fraud avoidance mechanism for Takaful.

Blockchain allows one to track the whole claims process, from submission to evaluation to approval, creating a transparent and verifiable system. All people see any unexpected involvement or delay. One research study on blockchain in insurance showed how smart contract-driven claims may keep all parties accountable. For example, if requirements are satisfied, the contract immediately executes payment, preventing any party from unjustifiably refusing or postponing the claim. From the insurer's side, this addresses false denials; from the participant's side, this addresses false claims; symmetrically, the rules are pre-set and obvious, so neither side can readily cheat. For instance, combining artificial intelligence with blockchain may automatically verify claims, lowering human error or collaboration in fraud detection. Should someone turn in the fake paper, artificial intelligence might find discrepancies, and the blockchain record guarantees the effort is recorded (and could perhaps be shared amongst businesses to block criminals). Furthermore, the distributed character of blockchain, with several nodes keeping the ledger, means that hackers cannot find a single point of failure to target. While an adequately secured blockchain (especially a permissioned one among known entities) is quite challenging to compromise because an attacker would need to control a majority of nodes to change records, an unlikely scenario in a consortium of reputable institutions traditional databases can be hacked to alter or steal data.

Beyond deliberate fraud, blockchain also lowers operational risks such as unintentional double payments or bookkeeping mistakes, which in traditional systems might be used advantageously. If a staff member unintentionally pays two payments for one claim, for example, a blockchain with smart contracts will probably block the second transaction should the set rules (e.g., policy status already closed after the first payout) be broken. This self-enforcing reasoning serves as a barrier against both error and corruption. Furthermore, as every member owns the ledger, responsibility is distributed. Should an abnormality arise, all parties. insurer, reinsurer, regulator, can see it and naturally discourage any party from trying manipulations.

Blockchain essentially changes the security paradigm for Takaful by enabling the system to be "secure by design," thereby avoiding numerous fraud routes upfront rather than depending on after-the-fact audits or fraud investigators. Pakistan's insurance sector primarily benefits from this as fraud events have caused confidence problems to some degree. Using a blockchain-based system will let Takaful operators tell customers the platform is safe and that technology is actively reducing fraud from inside or outside parties. Blockchain secures the ledger and transactions. Thus, it is not a panacea; insurers still have to guarantee

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appropriate data inputs (garbage in, garbage out problem), for example, confirming that information entered on-chain is accurate. Therefore, combining blockchain with dependable oracles and external data validation is a key issue.

4.3. Pakistani Regulatory Difficulties

Notwithstanding the possible advantages of blockchain technology, its acceptance in Pakistan's Takaful industry encounters significant regulatory and compliance challenges. According to the assessment, Pakistan is still in the early phases of policy development in this regard, even when other nations are advancing blockchain-friendly policies:

Lack of Clear Framework: Pakistan still lacks a specific legislative framework for blockchain in financial services, unlike countries that have developed fintech rules or crypto legislation. Regarding using distributed ledgers or smart contracts in Islamic finance, the SECP and SBP have not yet offered specific directions. For Takaful vendors, this leaves uncertainty. Can a smart contract lawfully carry out a policy? Will authorities or in court acknowledge a claim paid via blockchain or in cryptocurrencies? These issues remain unanswered. Without rules, every Takaful firm trying a blockchain pilot might run legal uncertainty, mainly if anything goes wrong (e.g., an innovative contract issue generating a payout error — who is liable?) In sharp contrast to Malaysia, where authorities have specifically encouraged innovation, Bank Negara Malaysia's sandbox has included Takaful tech innovations, and the country's central bank and securities commission have jointly issued comments on embracing fintech in Islamic finance international. Likewise, the UAE has government policies encouraging blockchain (Dubai's government started a Blockchain Strategy 2020), which indicates to sectors that it is safe to test. The authorities of Pakistan have begun to recognise fintech generally; for example, the 2019 position paper on digital assets by SECP and the recent actions taken by SBP enabling digital currencies show encouraging signals unlock-bc.com.unlocked-bc.com.

In November 2024, SBP even suggested policy reforms to legalise digital assets and allow banks to produce digital currencies, hence turning towards a more blockchain-supportive posture: unlock-bc.com unlock-bc.com. However, these advancements have not yet resulted in specific guidelines for insurance or the Takaful application of blockchain.

One unique feature of Islamic financial governance is the control by Shariah advisory boards. Every Takaful operator in Pakistan has a Shariah board, and national Shariah rules, under the Islamic Financial Services policies of the SECP, are followed there. Blockchain begs the issue of whether automated procedures and smart contracts fit Shariah-compliant operations. Some academics worry about whether a self-executing contract meets all the requirements to guarantee no injustice. If a smart contract, for instance, rigorously according to programmed rules, might there be circumstances when a human would exhibit compassion or apply Maslahah (public interest) factors missing from an algorithm? The literature acknowledges scholarly doubt at some level. Conversely, supporters of smart contracts contend that they can be created under the direction of academics to uphold Shariah standards; in fact, they can eradicate human mistakes that would cause non-compliance. Standardising "Shariah-compliant smart contracts" is under active debate. Working with technologists, Pakistan's Shariah boards might create certified templates for Takaful contracts using blockchain. Without such effort, authorities may be reluctant to permit blockchain use. This technical and Shariah compliance interaction presents a regulatory problem for multidisciplinary involvement (jurists and IT professionals working together).

Pakistan has cybersecurity systems and data privacy rules—akin to the Personal Data Protection Bill under review—but how they relate to blockchain is unclear. Does consumer data stored on a blockchain—even a permissioned one—comply with privacy criteria, for example? In a distributed network, who is considered the "data controller?" Legal meanings are changing everywhere. Gatteschi et al. (2018) pointed out that worries about data privacy and cybersecurity dangers hamper Pakistan's blockchain adoption. Regulators might be concerned that distributing data exposes more attack surfaces or impedes data localisation legislation implementation. On the other hand, modern blockchain systems can safeguard private data using encryption and permission restrictions -- e.g., keeping personal data off-chain and only including hashes on-

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chain. Pakistan's upcoming data protection law would probably affect how financial institutions use blockchain, maybe needing protections or approvals.

Legal Recognition of Blockchain Transactions: The legal standing of digital signatures and blockchain entries is a less obvious issue. Though it predates blockchain and does not specifically include distributed ledgers, Pakistan's Electronic Transactions Ordinance (2002) offers legal recognition for digital signatures and records. For competent contract-based insurance, one must clarify the legal enforceability of a policy stored on blockchain. Should conflict develop, will judges recognise the blockchain record as proof? These issues can call for new laws or modifications. Other nations have started to change their statutes; Dubai established a blockchain court to resolve brilliant contract conflicts. Pakistan could change its rules to offer clarity, requiring cooperation between legislators and financial authorities.

All things considered, deploying blockchain in Pakistan's Takaful industry is mainly hampered by regulatory lethargy and uncertainty. Global comparisons and the examined studies show that more blockchain use corresponds with regulatory proactivity—as seen in Malaysia's sandbox or the UAE's facilitating approach. Pakistan's officials must catch up by creating rules addressing Shariah compliance with blockchain contracts, specifying monitoring methods, and supporting regulated pilot projects so the country will not be left behind. Policy debates in 2023–24 reveal increased receptivity to digital money; thus, encouragingly, the tide is beginning to flip. Drawing on best practices from other markets, the following part on policy suggestions will explore particular actions industry and authorities might take.

4.4. Comparative Realisations from World Case Studies

A deeper understanding of Pakistan's possible future comes from comparing blockchain-based Takaful systems with traditional systems and looking at experiences elsewhere. Three comparison aspects surfaced: performance improvements vs more conventional approaches, case studies from Malaysia, UAE, and Indonesia, and market readiness considerations.

Performance Gains over Conventional: Blockchain technologies shine in speed, security, and transparency above conventional digital payment systems, as the comparison chart above summarises. One significant comparative realisation is the cost economy. Traditional insurance operations pay substantial expenses in record-keeping, reconciliation, and third-party services, such as bank clearinghouses. Using direct value transfer and automated reconciliation, blockchain may drastically reduce these expenses. Gatteschi et al. (2018) reported instances of cross-border transactions whereby blockchain lowered costs to a quarter of their traditional cost. Adopting blockchain might imply reduced running costs for a Takaful operator, which could convert into lower client contribution levels or better surplus distribution - thereby making Takaful more competitive. The initial investment cost of blockchain technology and the necessity of technical knowledge—which traditional systems do not demand to the same degree—are the trade-offs, though, since most insurers already have conventional IT systems. Although each operator would have to do their analysis, the results imply that over time, blockchain's operational savings and fraud reduction might exceed initial expenses (see Section 4.6.2 on cost-benefit). Moreover, existing conventional systems more easily interact with the larger financial ecosystem (banks, payment processors). To be viable in Pakistan, at least during a transition phase, blockchain networks for Takaful may require integration layers—for example, to link with bank accounts or mobile money—to be relevant.

Lessons from Malaysia: Malaysia's Takaful sector offers an appropriate analogy. This suggests a hybrid strategy in the medium run - something also hinted at in the findings (using blockchain with older systems initially). According to case studies and the literature, Malaysia's authorities and companies have been experimenting with blockchain in fields like claims and even Sukuk (Islamic bonds) issuing rsisinternational.org. One prominent example is a 2019 project whereby a group of Takaful operators and Malaysian insurers evaluated a blockchain solution for vehicle insurance claims, supposedly lowering inter-company claim settlement from weeks to a day. Strong regulatory support was credited for the achievement; Bank Negara Malaysia not only let it but also engaged through its sandbox, addressing any regulatory issues in the pilot stage. Another lesson from Malaysia is the value of industry cooperation: Takaful operators there, often rivals, came together utilising a shared blockchain platform to tackle shared pain points (fraud and

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sluggish claims). This group method meant knowledge-sharing and cost-sharing, which helped the adoption to be simplified. A similar cooperative approach could be required to apply an industry-wide blockchain network for Pakistan, where several Takaful businesses operate—including window Takaful operations of conventional insurers. Should every business try to go it alone, the advantages might be restricted, and interoperability problems could result. Malaysia also emphasises the need for research and skill; fintech entrepreneurs from Malaysian institutions have been actively investigating Islamic fintech solutions. For instance, studies by Zulaikha et al. (2024) in Malaysia using real Takaful operators in investigating claim procedures did not remain in academics. Use cases were developed in part by this link between academics and industry. Pakistan might copy this by supporting blockchain pilot projects between Takaful companies and universities—or NUST's fintech centre—to test ideas.

Lessons from UAE: Dubai's experience, in particular, illustrates the need for a top-down approach. As part of the Dubai Blockchain Strategy and UAE Vision 2021, the UAE government's drive for blockchain integration created a climate where even usually conservative industries like insurance were inspired to innovate. The story of Watania (National Takaful Company) in the UAE is instructive: they reduce processing time and improve earnings, somewhat ascribed to efficiency benefits, by using blockchain to manage auto reinsurance claims. The UAE also teamed up with a tech company offering a solution rather than each insurer creating their blockchain using InsurTech businesses like Addenda. This suggests that involving the startup ecosystem will hasten acceptance. Encouragement of indigenous fintech companies emphasising Islamic financing might help Pakistan. The UAE experience also illustrates that gradual adoption works: they began with a particular use-case (motor claim recoveries between insurers) rather than trying to put everything on blockchain simultaneously. That targeted strategy produced a real return on investment, which later helped to justify broad application to other uses. Starting with a single product line or procedure to test blockchain, Pakistani Takaful operators may scale up from family Takaful death claims or health Takaful hospital bill verification. This might be made easier by regulatory sandboxes or innovation centres like Dubai's FinTech Hive.

Lessons from Indonesia: Although Indonesia boasts a sizable Islamic financial industry, especially in rural areas, Takaful penetration is somewhat low. Micro-takaful alternatives, low-cost, basic insurance for the public, have been under consideration in Indonesia. Because blockchain may lower administrative expenses (making small policies feasible) and establish confidence among those dubious insurers, Indonesian fintech developers see it as a means of managing micro-insurance. Using mobile app interfaces on the front end and blockchain at the rear end, one experiment comprised a blockchain-based cooperative microfinance platform that might be extended to micro-Takaful. The lesson here is inclusivity: by allowing a transparent structure for contributions and claims, blockchain might enable new models (like peer-to-peer Takaful or community-based pools) that could draw sectors of the population hitherto unserved by insurance. Pakistan also has a large uninsured population and a confidence gap with traditional insurance; a blockchain-driven micro-Takaful product (maybe provided via telecom mobile money services) may draw such individuals in. Indonesia likewise emphasises that buy-in for new fintech requires robust Shariah governance and public awareness efforts; its national Shariah board is developing rules for "digital Shariah products." Inspired by Pakistan's academics, one may proactively research these models to provide recommendations or fatwas endorsing blockchain use in line with Shariah.

A comparative study reveals that effective adoption usually depends on specific market conditions: technological infrastructure, consumer preparedness, and regulatory backing (described above). Technically, nations with higher degrees of digital literacy and internet penetration find it simpler to implement blockchain-based services. Though digital literacy and fintech awareness remain issues (digital financial inclusion is just ~18% brecorder.com), Pakistan has made progress in internet access as of 2024, ~46% internet penetration brecorder.com%). This suggests that user education and simple interfaces are needed beyond implementing a blockchain system. If consumers mistrust or misinterpret the finest technology, it will also fail. The user base in Malaysia/UAE was considerably more ready, or the offers were back-end—that is, the end user only saw quicker service without knowing blockchain was involved. Initially, Pakistan may choose the latter route: use

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blockchain in the back-end of Takaful processes and show customers a familiar interface so they will not have to learn blockchain to gain from it. As familiarity increases, more creative ideas—such as peer-to-peer blockchain risk sharing—could be expressed.

Finally, as shown in other markets, the comparative findings confirm that blockchain may provide advantages in the Takaful system; success primarily depends on non-technical elements (regulations, cooperation, customer acceptability). Pakistan has much to grow from these forebearers. The conversation now shifts to how Pakistan may use these ideas: What doable actions might help to overcome obstacles and support blockchain-based innovation in the Takaful sector?

4.5. Implications for the Takaful Industry in Pakistan

The results above underline the transforming possibilities of blockchain for Family Takaful and the challenges Pakistan has to solve. Pakistan's Takaful industry is at a crossroads: it may either start using blockchain and follow world trends or risk lagging, given inefficiencies and trust problems. Several consequences and issues surface

One of the main obstacles is regulatory inertia; policies and legislative action are therefore much needed. Takaful providers would be reluctant to invest in blockchain without clarification from SECP and SBP. The consequence is that, like Bank Negara Malaysia did, Pakistani authorities had to act to offer direction. This indicates openness to innovation by granting sandbox permissions or no-objection certifications for trial initiatives, not by quickly altering legislation. Early engagement with Shariah scholars also helps address compliance issues. Scholars who participate in the development process might support the eventual blockchain concept, lending credibility to it from the perspective of management and customers.

Infrastructure and Skill Development: Pakistan's financial industry lacks the technological foundation for blockchain (node servers, safe networks, etc.). Furthermore, competent human resources are few. It follows that capacity development is needed. Takaful operators could have to collaborate with tech businesses or fund training for their IT personnel on blockchain systems (like Hyperledger Fabric, Ethereum, or any corporate DLTs). Luckily, knowledge of blockchains is expanding worldwide and accessible via alliances. Consortium architecture is another strategy whereby the industry may create a common blockchain infrastructure (maybe under the Pakistan Insurance Association or IAP) that all Takaful operators utilise instead of every firm building its blockchain network. This would promote standardisation and help share resources.

Consumer Trust and Awareness: Fear of fraud has caused Pakistani consumers to mistrust digital money, usually preferring cash or conventional means. Introducing blockchain-based Takaful means teaching users that the new system is advantageous and safe. The implication is the need for awareness efforts and knowledge acquisition. Together, takaful businesses should organise outreach (workshops, media campaigns) outlining how blockchain promotes openness and how their money and data stay safe. Emphasising good examples from Islamic nations (such as "Dubai's Islamic insurers use blockchain and saw fraud drop to zero") will help the idea to be more relevant and persuasive. This initiative aligns with the more significant movement for financial inclusion: individuals would be more likely to test a blockchain Takaful product if they know it is reliable and under the control of academics and authorities.

The debate calls for Pakistan to use a staged strategy for using blockchain in Takaful. First, to demonstrate the idea and iron out teething problems, concentrate on a confined use case—such as internal claim processing or reinsurance settlements. Then, it will progressively widen to consumer-facing uses (such as blockchain policy creation or donation collecting). Neither practical nor sensible is a big-bang approach—turning the whole system over to blockchain overnight. Phasing allows operators to track impact, regulators to change rules quickly, and customers to change with the least disturbance. This deliberate approach reflects the inference from how other markets handled fintech developments.

Working with Global Peers: Pakistani stakeholders should not start from scratch, as Malaysia, UAE, and others are ahead on this curve. One might get to work with or at least interact with colleagues abroad. For instance, a Pakistani Takaful company may collaborate with a Malaysian InsurTech already equipped with a blockchain solution, importing tried-and-tested technology. Similarly, Pakistani authorities may interact with

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UAE or Malaysian officials to determine how they handled particular legal matters. This international cooperation may hasten Pakistan's learning curve. Pakistan may use the networks established by forums such as the Islamic Financial Services Board (IFSB) and other international groups since they already show fintech in Islamic finance under discussion.

The research results for Pakistan centre on modernising the ecosystem: changing laws, developing technologies and human capability, and encouraging participant trust. Although theoretically, the advantages of blockchain for Takaful are apparent, they have been shown elsewhere and will need coordinated efforts all around to be unlocked in Pakistan.

5. Conclusions

Eventually, For Pakistan's Family Takaful industry, blockchain offers transforming possibilities for security, efficiency, and openness in keeping with Islamic financial ideas. Through digital channels, it can lower costs, cut fraud, hasten claim settlements, and increase services' reach. Key success elements include customer confidence, technical preparedness, and legislative clarity. Essential are regulations, infrastructural projects, education, policy changes, industry cooperation, technology, and literacy investments, which would help Pakistan strengthen and modernise its Takaful sector. This might motivate other countries to adopt similar policies combining Islamic values with technology to build a better future. The picture is bright if all the players aim towards a modernised, Shariah-compliant financial system.

Ethical Approval

This study is based entirely on secondary data obtained from published sources, including peer-reviewed journals, industry reports, and regulatory documents. No human participants were involved in the research. Therefore, formal Institutional Review Board (IRB) approval was not required. However, all ethical considerations were strictly followed, including proper citation of sources and adherence to academic integrity.

Authors' Contributions

Jahanzeb Khan: Conceptualization (lead); Methodology (equal); Writing – Original Draft (lead); Writing – Review & Editing (equal).

Zakee Saadat: Methodology (equal); Data Curation (lead); Analysis (lead); Writing – Review & Editing (equal).

Abdul Razaque Bhayo: Investigation (lead); Validation (lead); Writing – Review & Editing (equal).

Khusbakht Bibi: Conceptualization (supporting); Resources (lead); Supervision (lead); Writing – Review & Editing (lead)

All the authors have read and approved the final manuscript.

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Data Availability

The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request. The authors are committed to transparency and will provide detailed methodological information and analysis protocols upon request.

References

Bank Negara Malaysia. (2016, October 18). *Financial Technology Regulatory Sandbox Framework*. https://www.bnm.gov.my/-/financial-technology-regulatory-sandbox-framework

Bank Negara Malaysia. (2024, February 29). *Policy document on Fintech Regulatory Sandbox Framework*. https://alumni.bnm.gov.my/web/guest/-/sandbox-pd24

Gatteschi, V., Lamberti, F., Demartini, C., Pranteda, C., & Santamaría, V. (2018). Blockchain and smart contracts for insurance: Is the technology mature enough? *Future Internet, 10*(2), Article 20. https://doi.org/10.3390/fi10020020

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https://insightfuljournals.com/

Grima, S., Spiteri, J., & Romānova, I. (2020). A STEEP framework analysis of the key factors impacting the use of blockchain technology in the insurance industry. *The Geneva Papers on Risk and Insurance—Issues and Practice, 45*, 398–425. https://doi.org/10.1057/s41288-020-00162-x

Kar, A. K., & Navin, L. (2021). Diffusion of blockchain in insurance industry: An analysis through the review of academic and trade literature. *Telematics and Informatics*. https://doi.org/10.1016/j.tele.2020.101532

Laldin, M. A., & Djafri, F. (2019). Islamic finance in the digital world: Opportunities and challenges. *Journal of Islam in Asia, 16*(3), 283–299. https://doi.org/10.31436/jia.v16i3.853

Page, M. J., McKenzie, J. E., Bossuyt, P. M., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, Article n71. https://doi.org/10.1136/bmj.n71

Securities and Exchange Commission of Pakistan. (2012). *Takaful Rules, 2012*. https://www.secp.gov.pk/document/takaful-rules-2012/

Sheth, A., & Subramanian, H. (2020). Blockchain and contract theory: Modeling smart contracts using insurance markets. *Managerial Finance, 46*(6), 803–814. https://doi.org/10.1108/MF-10-2018-0510

Zulaikha, S., Mohamed, H., & Rosyidi, L. N. (2024). Smart contracts on blockchain for insurance and Takaful industry. *Insurance Markets and Companies, 15*(2), 85–93. https://doi.org/10.21511/ins.15(2).2024.08