

# Takaful industry and Blockchain: challenges and opportunities for costs' reduction in Islamic insurance companies

Maha Radwan<sup>1</sup>, Davide Calandra<sup>1</sup>, Paris Koumbarakis<sup>2</sup>, Federica Lanzara<sup>1</sup>

1. Department of Management, University of Turin (Italy)
2. Centre for Entrepreneurship, University of St. Gallen (Switzerland)

**Abstract**— Takaful insurance is increasing its consideration. Islamic insurance provides mutual aid and protection. However, the different model does not always make the business efficient. Several studies have shown the difficulty of Takaful companies in limiting their operating costs and having efficient borders. To reduce such operating costs and reach economies of scale, this paper assesses the adoption of the Blockchain technology as a critical value for the Islamic insurance industry. Building upon a literature review and drawing on the SWOT framework, this paper outlines internal strengths and weaknesses as well as external opportunities and threats. Our analysis reveals that the Blockchain technology can help in the reduction of fraud, increase timeliness of actions for customers, allow for faster and more efficient management of claims and improve the risk management. Theoretical and practical implications are discussed.

**Keywords:** Takaful, Islamic finance, blockchain, distributed ledger technologies

## I. INTRODUCTION

Takaful aims to offer an Islamic and Shari'ah alternative to conventional insurance models [1]. There are three main differences between conventional and Islamic insurance.

First, the most significant feature is the nature of the contract, which oversees the relationship between policyholders and companies. Conventional insurance is based on the risk transfer idea, the person who needs protection from a specific event transfers the risk to the insurance company in exchange for the payment of a cash premium [2], [3]. Instead, the Islamic insurance tool provides mutual aid and protection for both individual and corporate bodies [2]. Takaful is a contract in which the participants regularly contribute to a mutual fund and subsequently guarantee each other the compensation of any specific risks [1], [4].

Second, as a consequence of the first, in Takaful, insurances changed the relationship between insured person and insurer [5]. This difference is determined indirectly from Shari'ah law which through the precepts of *Gharar* (uncertainty), *Maisir* (gambling) and interest rate (*riba*) not allowing the recognition of traditional insurance [6]–[8].

Third, as with conventional insurance, Takaful generates profits. Instead of being distributed to shareholders, these profits are given to the protection fund itself according to the mutual and cooperative purpose of the contract [1], [2], [9].

Also, the manager of the operations receives a remuneration which is a percentage function of the operating surplus carried out [5].

Briefly, according to the related literature the first Takaful was set up in Malaysia by “The Islamic Insurance Company” in 1979 after a long process of discussion between academics and professionals [5]. So, Islamic insurance is relatively new and after first experiences in Malaysia, also Saudi Arabia, UAE and Bahrain established and recognized Takafuls as a eligible medium [9]. Despite this limited period, according to the report of Shereen et al. (2018) Takaful assets have grown from US\$31 billion in 2012 to US\$46 billion in 2017 with a CAGR of 6%. Moreover, the same report predicts that Takaful's assets will reach US\$72 billion in 2023 making the topic critical for research.

At the same time, this growth is partly opposed by conflicting studies in terms of costs efficiency compared to traditional insurance companies [11]. The study of Akhtar (2018) highlight that Takaful companies in Saudi Arabia tend to outperform in terms of efficiency scores. However, there remain some problems in terms of the additional costs to be incurred in order to be Shari'ah compliant.

Although with opposite results, studies also argue that Takaful companies should control operating costs and make economies of scale to increase efficiency [13], [14].

One of the most important technologies in the last years allowing for increased efficiency and transparency is Blockchain. The term means a chain of block which links together different peer-to-peer computers that are able to share information [15]. Due to its technical characteristics as decentralization and authentication, Blockchain allows replacing the management of the firm's traditional information system [16]. With a general and distributed ledger, different computers (nodes) could add and share information among the

network reducing operative costs and increasing transparency [17].

Given these benefits, this paper explores the possibility of using Blockchain, as a critical value for the Islamic insurance industry, in order to reduce operating costs and reach economies of scale.

For this reason, the research question is: How Blockchain could be useful for the Takaful industry by reducing costs?

The paper aims to assist Takaful's insurance management in the challenge of reducing costs maintaining competition with the traditional insurance sector.

The paper is organized as follow. Section 2 outlines general and Takaful structures. Section 3 analyses the main characteristics of Blockchain. Section 4 explains the practical applications that Blockchain could have in Takaful insurance. Section 5 discusses and concludes using the SWOT analysis framework considering internal strengths and weaknesses; as well as, external threats and opportunities of Blockchain in Takaful industry. The section also provides limitations and future implications.

## II. TAKAFUL

The Islamic insurance "Takaful" implies "solidarity", is set up in a cooperative model and incorporates social welfare ideals [1].

Compared to the traditional insurance in which an individual insured pays a premium in exchange for the risk's shift, the Islamic model is based on the sharing of risk within the same social group [1], [5]. The differences concerning the conventional model include several elements.

First, the Islamic approach considers the payment of the insurance premium and awaiting any adverse event a gamble. This element goes against the principle of Gharar (uncertainty) [18], and is admitted through the Tabarru, which is a financial disbursement in terms of donation made by the participants [19].

Second, the Islamic perspective considers traditional insurance as gambling and for this reason, prohibited (Maysir) [2].

Third, it concerns investments' method of premiums which do not respect the Islamic finance rule of riba - the prohibition of interest rate [6], [18].

Fourth, for insurance companies, profit derives from the management of the risk of the insurance contract and not from the assumption of the risk [18].

The main structures that will be explained are the Mudarabah and the Wakal models.

The template is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may note peculiarities. For example, the head margin in this template measures proportionately more than is customary. This

measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

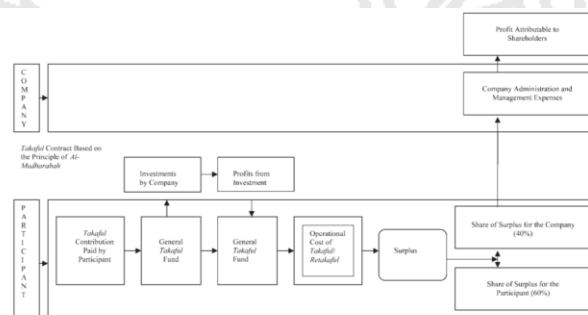
## III. MUDARABAH MODEL

According to the Mudarabah model, the participants of the fund (*Rabb al-mal*) contribute the capital to another person who is delegated to carry out investment activities (Takaful's manager - *mudarib*), and to share the profits according to a predeterminate ratio [1], [5]. If there are losses, they will be shared among the fund participants, in case of negligence, and the manager Takaful will also participate [9].

As shown in Figure 1, the underwriting of Takaful policies provides premiums' crediting in a separate account, which is Tabarru [18]. This account belongs to the participants, the manager participates if profits are made. The model is particularly favourable for use in life insurance [2].

Therefore, the insured amount depends on the payments into the Tabarru account and on the profits obtained, always considering the minimum guaranteed in case of adverse event [18].

Fig. 1. Mudarabah model



Source: [18]

## IV. WAKALA MODEL

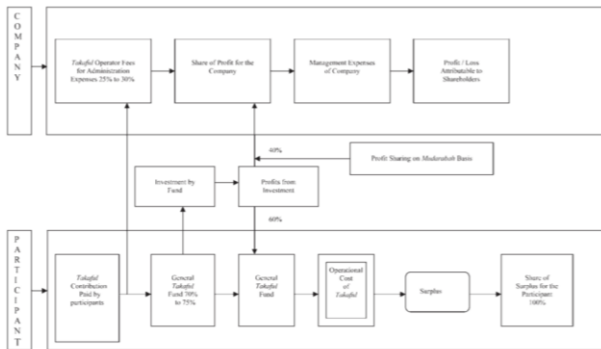
The Wakala model is based on the agency contract [9]. The participants in the Takaful insurance fund (*Wakil*) delegate one person (*Takaful operator*) who manages the risk of the fund [1]. Upon subscription by the participants, through a donation, the Wakil will be authorized to carry out two activities: underwriting Takaful and investments activities [5]. The Wakala model provides for the subscription of the investment fund and the risk fund based on the Tabarru [18].

The agency agreement provides for the payment by the participants of a percentage fee of the managed funds (*Wakala fee*) to cover management costs and a performance fee. Part of the donated sum will be invested and managed in Halal assets, typically public securities and securities of financial companies [18].

The amount managed by the investment fund will be paid to participants in case of an adverse event, while those of the

risk fund will be used for refunds. In the case of surplus or profit, the balance can be distributed to the Wakil in proportion to the donations made by them [1].

Fig. 2. Wakala model



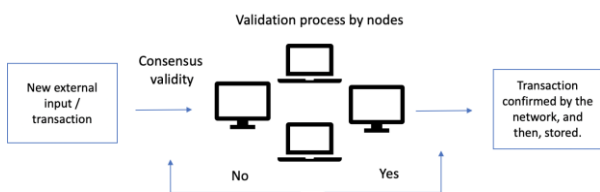
Source: [18]

V. BLOCKCHAIN

According to Rainero et al. (2019), Blockchain is one of the most persistent characters in the last year. The definition is confirmed by a large number of applications as reported by the systematic analysis of Casino et al. (2019). The essential characteristic of Blockchain is related to the logic of consensus [22]. Blockchain is set up by many interconnected nodes (peer-to-peer computers). Effectively, Blockchain is a communication protocol made up of a series of blocks identified by a hash, a non-reversible algorithmic function. As summarized in figure 3, each new transaction or information must be validated through a consensus mechanism before being recorded in the shared ledger. The validation process, based on the decision of the connected nodes, decides whether to validate or not the transaction. the confirmation of a transaction contributes to the creation of the Blockchain. By contrast, in case the validation process is not favourable, it is not inserted in the Blockchain.

In order to create a new block, preventive control and validation by the network are necessary [22]. This requires the resolution of mathematical problems by “miners”, who also contribute to making the information entered cryptographically non-attachable.

Fig. 3. Validation process of transaction using Blockchain



Source: authors' elaboration

In the Blockchain, there are different levels of consensus. One of the best known is Proof-of-Work (PoW), which requires the resolution of high intensify mathematical problems to ensure verifiability and immutability of transaction, and which for this reason require a large amount of energy [23].

Alternatively, the Proof-of-Stake (PoS) algorithm can be used. In this case, the creation of a new block, and therefore, its consensus is entrusted through selections of random combinations to the network [24].

The analysis of the literature highlights various types of Blockchain depending on the creation's rules.

First, public Blockchain is characterized by a participatory and democratic process [15]. Everyone can carry out operations and create a new node in the Blockchain (after verifying consensus).

Secondly, private Blockchain is built-in private ecosystems and the actors involved in validating and entering transactions are carefully selected and authorized. This allows to increase the level of privacy but goes against the original idea of public and distributed registry [25].

VI. THE USE OF BLOCKCHAIN IN TAKAFUL INDUSTRY

After One of the essential elements of Blockchain is transparency, which is also relevant for Islamic finance [6], [22]. Other advantages and disadvantages can be highlighted from the application of Blockchain within the Islamic insurance industry.

First, the management of claims by the unchangeable and distributed register will contributes to the reduction of fraud between insurance companies through the integrated analysis of complaints received. One of the direct implications is towards the motor insurance branch. Using IoT systems and sensors, it will be possible to identify adverse events. This contributes on the one hand to the reduction of fraud and, on the other, increases the timeliness of actions towards the customers. This could be possible by including in the network also other subjects such as experts and police forces able to verify the truthfulness of the information provided.

Secondly, the presence of a shared and immutable ledger will allow for faster and more efficient management of claims by companies using intelligent contracts. In the same way, the management of the payments of the donations will allow a saving in terms of time for the Islamic companies.

Thirdly, the presence of shared public databases will allow companies to identify information on the risk merit of all Takaful participants.

Fourthly, claims management will allow clients to monitor the process in real-time, avoiding elements of uncertainty and lack of transparency, also through the valid proof of the terms of issuance of policies.



## VII. DISCUSSION AND CONCLUSION

Following the primary Blockchain literature, the potential lies in the possibility of reducing costs, increasing transparency and reducing the information asymmetry between contractual counterparties [15], [22].

The implementation of Blockchain in the at the insurance level can potentially decrease repetitive actions and thus decrease the GAP compared to traditional insurance companies [8], [18].

The use of the Blockchain at first can be implemented for the management of payments by subscribers. Besides, this would also allow the creation of a single decentralized database capable of perceiving any fraud due to repeated claims. With the creation of the transaction, all the information will be shared in the network.

This paper aims to support the strategic choices of managers of takaful insurance companies. For this reason, Table 1 shows the SWOT analysis of the implementation of Blockchain in the Takaful industry [26].

One of the main strengths of Blockchain is the accessibility of information in real-time and distributed [15]. In the insurance field, this allows for an increase in transparency, as established by *Gharar* [7]. Moreover, insurance managers could implement Blockchain also in order to reduce fraud by sharing and verifying distributed records.

On the other hand, the use of Blockchain may also have weakness issues. As stated by Conte De Leon et al. (2017) and Mehar et al. (2019), in June 2016 the registers distributed on the network of blocks were hacked in this way violating the code and information present in the intelligent contracts. In addition to causing damage of 50 million dollars.

Furthermore, the resolution of high intensifies mathematical problems to ensure verifiability and immutability of transaction required a large amount of energy [23].

Externally, the opportunities appear to be countless. Managers will be able to invest resources in the creation of pilot projects aimed at reducing operating costs. Therefore, at least in the short term in case of operations, reduce the GAP in terms of efficiency highlighted by the contributions of various researchers [8], [12]–[14].

At the same time, the possible implementation of the Blockchain is not free from threats. First, due to the primary use of technology in insurance, this may lead to failure and loss of investment.

Finally, as shown, Blockchain is not free of threats, which is why it will be necessary to establish guidelines for the privacy of insured persons.

TABLE I. SWOT ANALYSIS OF BLOCKCHAIN IN TAKAFUL INSURANCE INDUSTRY

<i>Strengths</i>	<i>Weakness</i>
1. Accessibility of information 2. Increasing transparency in favour of the Halal precepts 3. Reduce fraud by sharing and verifying distributed records 4. Improving operational efficiency	1. Verification of consensus and possibility of data manipulation 2. Energy consumption
<i>Opportunities</i>	<i>Threats</i>
1. Creation of pilot projects on individual insurance products 2. Reduction of operating costs 3. Gap reduction compared to traditional insurance companies	1. Early stage adoption 2. Investment costs 3. Need to define guidelines for the privacy of information

*Source: authors' elaboration*

At the same time, the possible implementation of the Blockchain is not free from threats. First, due to the primary use of technology in insurance, this may lead to failure and loss of investment.

The paper has various limitations. Given that this research is still in a very early phase future empirical analyses are necessary and planned in form of case studies. Moreover, further research is needed in order to highlight whether managers of Takaful companies will be willing to make investments in Blockchain

## ACKNOWLEDGMENT

Authors are grateful for the useful discussion during the European Journal of Islamic Finance Workshop held in October 2019.

## REFERENCES

- [1] Masud H. (2010). Takaful: An Innovative Approach to Insurance and Islamic Finance Comment, vol.4, 1133–1164.
- [2] Bakar M. D. (2012). Shari'ah Principles Governing Takaful Models», in Takaful Islamic Insurance, John Wiley & Sons, Ltd, 31–45.
- [3] Khan H. (2015). Optimal incentives for takaful (Islamic insurance) operators, Journal of Economic Behavior & Organization, vol.109, 135–144. doi: 10.1016/j.jebo.2014.11.001.
- [4] Marhanum, C.M.S, Che Mohd Salleh M., Irwani Abdullah N., Razali S. S., e Wok S. (2012). Takaful Agents' Roles in Accordance with the Quran and Sunnah, GJAT, vol. 2, n. 2, 41–45. doi: 10.7187/GJAT212012.02.02.
- [5] Sadeghi M. (2010). The evolution of Islamic insurance - Takaful: a literature survey, Insurance Markets and Companies, vol. 1, n. 2.

- [6] Biancone P. P. and Radwan M. (2019). Social Finance and Financing Social Enterprises: An Islamic Finance Prospective, *European Journal of Islamic Finance*. doi: 10.13135/2421-2172/3176.
- [7] Chong B. S. Liu M-H. (2009). Islamic banking: Interest-free or interest-based?, *Pacific-Basin Finance Journal*, vol. 17, n. 1, 125–144. doi: 10.1016/j.pacfin.2007.12.003.
- [8] Khorshid A. (2004). *Islamic Insurance : A Modern Approach to Islamic Banking*. Routledge.
- [9] Biancone P. P. (2017). *La banca islamica*. Torino: Giappichelli.
- [10] Shereen M., Abdulaziz G., Hasan S. (2018). «Islamic Finance Development Report 2018». Salaam gateway.
- [11] Abbas M., Khan Bakhsh A., Abbas S., Mahmood Z. (2019). Determinants of Cost Efficiency of Takaful and Conventional Insurance Firms of Pakistan, *Review of Economics and Development Studies*, vol. 4, n. 2, Available at: <http://www.publishing.globalcsrc.org/ojs/index.php/reads/article/view/418>.
- [12] Akhtar M. H. (2018). Performance analysis of Takaful and conventional insurance companies in Saudi Arabia, *Benchmarking: An International Journal*. doi: 10.1108/BIJ-01-2017-0018.
- [13] Almulhim T. (2019). Analysis of Takaful vs. Conventional insurance firms' efficiency: Two-stage DEA of Saudi Arabia's insurance market», *Cogent Business & Management*, vol. 6, n. 1.
- [14] Khan A., Noreen U. (2014). Efficiency Measure of Insurance v/s Takaful Firms Using DEA Approach: A Case of Pakistan, *Islamic Economic Studies*, vol. 22, n. 1, pagg. 139–158.
- [15] Yoo S. (2017). Blockchain based financial case analysis and its implications, *Asia Pacific Journal of Innovation and Entrepreneurship*, vol. 11, n. 3, 312–321. doi: 10.1108/APJIE-12-2017-036.
- [16] Dai J., Vasarhelyi M. A. (2017). Toward Blockchain-Based Accounting and Assurance, *Journal of Information Systems*, vol. 31, n. 3, 5–21. doi: <https://doi.org/10.2308/isys-51804>.
- [17] Weigand H., Blums I., de Kruijff J. (2018). Shared Ledger Accounting - Implementing the Economic Exchange Pattern in DL Technology, in *Advanced Information Systems Engineering*, vol. 10816, 342–356. doi: 10.1007/978-3-319-91563-0\_21.
- [18] Wahab A. R. A., Lewis M. K., Hassan M. K. (2007). Islamic takaful: Business models, Shariah concerns, and proposed solutions, *Thunderbird International Business Review*, vol. 49, n. 3, 371–396. doi: 10.1002/tie.20148.
- [19] El- Gamal M. A. (2007). Mutuality as an antidote to rent-seeking Shariah arbitrage in Islamic finance, *Thunderbird International Business Review*, vol. 49, n. 2, 187–202. doi: 10.1002/tie.20139.
- [20] Rainero C., Puddu L., Migliavacca A., Coda R., Modarelli G. (2019). Bit Standard- Bitcoin between reality and risks of a halfway-money, *Afr. J. Bus. Manage.*, vol. 13, n. 7, 215–225. doi: 10.5897/AJBM2018.8724.
- [21] Casino F., Dasaklis T. K., Patsakis C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues, *Telematics and Informatics*, vol. 36, 55–81. doi: 10.1016/j.tele.2018.11.006.
- [22] Iansiti M., Lakhani K. R. (2017). *The Truth about Blockchain*, Harvard Business Review. Available at: <https://hbr.org/2017/01/the-truth-about-blockchain>.
- [23] Coyne J. G., McMickle P. L. (2017). Can Blockchains Serve an Accounting Purpose?, *Journal of Emerging Technologies in Accounting*, vol. 14, n. 2, 101–111. doi: <https://doi.org/10.2308/jeta-51910>.
- [24] Kiayias A., Russell A., David B., Oliynykov R. (2017). Ouroboros: A Provably Secure Proof-of-Stake Blockchain Protocol, in *Advances in Cryptology – CRYPTO*, 357–388.
- [25] O'Leary D. E. (2017). Configuring blockchain architectures for transaction information in blockchain consortiums: The case of accounting and supply chain systems., *Intelligent Systems in Accounting, Finance & Management*, vol. 24, n. 4, 138–147.
- [26] Jackson S. E., Joshi A., Erhardt N. L. (2003). *Recent Research on Team and Organizational Diversity: SWOT Analysis and Implications*», *Journal of Management*, vol. 29, n. 6, 801–830. doi: 10.1016/S0149-2063\_03\_00080-1.
- [27] Conte De Leon D., Stalick A. Q., Ananth Jillepalli A., Haney M. A., Sheldon F. T. (2017). Blockchain: properties and misconceptions, *Asia Pacific Journal of Innovation and Entrepreneurship*, vol. 11 I, n. 3, 286–300. doi: <https://doi.org/10.1108/APJIE-12-2017-034>.
- [28] Mehar M. I. (2019). Understanding a Revolutionary and Flawed Grand Experiment in Blockchain: The DAO Attack», *JCIT*, vol. 21, n. 1, 19–32. doi: 10.4018/JCIT.2019010102.

## Editor in Chief

**Prof. Paolo Pietro Biancone,**  
University of Turin, Italy

## Editorial Board

Prof. Dian Masyita, University of Padjadjaran, Indonesia  
Prof. Abdulazeem Abozaid, Qatar Faculty of Islamic Studies, Qatar  
Prof. Ahmad Aref Almazari, King Saud University, Saudi Arabia  
Prof. Bashar Malkawi, University of Sharjah, UAE  
Prof. Marco Meneguzzo, Università degli Studi di Roma "Tor Vergata", Italy  
Prof. Buerhan Saiti, Istanbul Sabahattin Zaim University, Turkey  
Prof. Nidal A. Alsayyed, Inayah Islamic Finance Research Institute, USA  
Prof. Roberta Ahuffi, University of Turin, Italy  
Prof. Ghassen Bouslama, NEOMA Business School, Campus de Reims, France  
Prof. Nazam Dzolkarnaini, Salford University, UK  
Prof. Kabir Hassan, University of New Orleans, USA  
Prof. Khaled Hussainey, University of Portsmouth, UK  
Prof. Rifki Ismal, University of Indonesia  
Prof. Tariqullah Khan, Hamad bin Khalifa University, Qatar  
Prof. Ali Khorshid, ICMA Centre Reading University, UK  
Prof. Amir Kia, Utah Valley University, USA  
Prof. Laurent Marliere, Université Paris-Dauphine, France  
Prof. Federica Miglietta, University of Bari, Italy  
Prof. Hakim Ben Othman, University of Tunis, Tunisia  
Prof. Mohamed Ramady, King Fahd University of Petroleum and Minerals, Saudi Arabia  
Prof. Maunum Rashid, Nottingham University, Malaysia  
Prof. Younes Soualhi, International Islamic University, Malaysia  
Prof. Laurent Weill, University of Strasbourg, France