

FINTECH IN ISLAMIC FINANCE

Featuring high-level analysis of Islamic law, this book examines fintech in Islamic finance from both theoretical and empirical perspectives. Whilst building on existing approaches, it also discusses the current application of fintech in promoting financial inclusion through innovative solutions in Muslim-majority countries, identifying future directions for policy-makers.

With original chapters written by prominent academics, senior lawyers and practitioners in the global Islamic finance industry, this book serves as the first standalone pioneering reference work on fintech in Islamic finance. It also, for the first time, examines the position of Islamic law on cryptocurrencies, such as bitcoin. Besides the conceptual analysis of the Shari'ah and legal aspects of fintech in Islamic finance, this book provides relevant case studies showing current and potential developments in the application of fintech in various sectors ranging from crowdfunding and smart contracts, to Online Dispute Resolution, Investment Account Platform and identity verification in the KYC process.

Setting the agenda for researchers in the field, *Fintech in Islamic Finance* will be useful to students and scholars of Islamic finance and financial technology.

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FINTECH IN ISLAMIC FINANCE

Theory and Practice

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After the workshop, which was very engaging and rich in discussion, we decided to invite some key contributors from across the world who are accomplished professionals to contribute to a book believed to be the first of its kind. Some of the chapters in this book were developed later based on preliminary written comments submitted for the workshop. From that moment onwards, we widened the potential contributors’ base to include other leading authors.

This painstaking effort in identifying leading authors for this pioneering project is unprecedented; and we would like to thank all contributors for their support and cooperation throughout the editing process. Despite the numerous iterations with the authors and scores of correspondences to ensure all chapters were turned in within a reasonable time, we found the authors to be very cooperative and responsive. We are convinced that this would not have been possible without the constant reminders from the publisher to meet the timeline for the book. Specifically, we appreciate the efforts of one of the contributors, Dr. Sadiq Omoola, and a research scholar, Abdurahman Jemal Yesuf, both of whom helped at different stages in ensuring all chapters comply with the standard referencing style in a consistent manner.

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We hope these humble efforts will help to spur further research in this unique field and trigger further innovative fintech products, services and solutions in the global Islamic financial services industry.

Umar A. Oseni
S. Nazim Ali

ABBREVIATIONS

AAOIFI	Accounting and Auditing Organisation for Islamic Financial Institutions
ADR	Alternative Dispute Resolution
AH	After Hijrah. This is used to denote the Islamic Calendar, which counting began in the year Prophet Muhammad migrated from Makkah to Medina
AI	Artificial Intelligence
AML	Anti-Money Laundering
API	Application Programming Interface
ATM	An automated teller machine
B2B	Business-to-business or trade conducted between business via the internet.
B2C	Business-to-consumers or trade conducted between businesses and consumers via the internet.
BSAS	Bursa Suq Al-Sila – an online platform in Malaysia for managing commodity <i>murābahah</i> transactions
BTC	Bitcoin
CMTPT	Commodity Murabahah Trading Platform
CPU	Central Processing Unit
DAG	Directed acyclic non-recursive graph for storing transactions
DAO	Decentralised autonomous organisation
DAPPS	Decentralised applications
DFSA	Dubai Financial Services Authority
DIAO	Decentralised intelligent autonomous organization
DLT	Distributed Ledger Technology
DMCC	The Dubai Multi Commodities Centre
ECF	Equity crowdfunding

EPR	Expected Profit Rate
ESG	Environmental, Social and Governance
EY	Ernst & Young
FAST	Malaysia's Fully Automated System for issuing/Tendering
GAFA	Google, Amazon, Facebook and Apple
GCC	Gulf Cooperation Council
GDP	Gross Domestic Product
GDPR	The European Union General Data Protection Regulation
GPS	Global Positioning System
HNWI	High Net Worth Investors
HTTP	A simple but universal mechanism for retrieving resources
IAP	Investment Account Platform
ICO	Initial coin offering or initial currency offering (sometimes called "initial public coin offering")
IFSB	Islamic Financial Services Board
ICT	Information and Communications Technology
IOT	Internet of Things
IOTA	A Distributed Ledger Technology developed by the <i>IOTA</i> Foundation
KYC	Know Your Customer
LEI	Legal entity identifier
MEPS	Malaysian Electronic Payment System
MSMES	Micro, Small and Medium Enterprises
ODR	Online Dispute Resolution
P2P	Peer-to-Peer
PBUH	Peace be upon him [Prophet Muhammad]
R&D	Research and development
REGTECH	Regulatory technology
RELAB	Regulatory laboratory
ROI	Return on Investment
S&P	Rating agency, Standard and Poor's
SDG	United Nations Sustainable Development Goals 2030
SME	Small and medium enterprises
SPV	Special Purpose Vehicles
SRI	Socially Responsible Investing (or Investments)
SSID	Self-Sovereign Identity
URIS	A way to identify entities

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PART I

Introduction

1

FINTECH IN ISLAMIC FINANCE

Umar A. Oseni and S. Nazim Ali

Just as we were completing the editing of this book, Malaysia introduced a new subsidiary legislation to regulate cryptocurrencies in the country. The news hit global headlines, particularly among the tech communities. The law, Capital Markets and Services (Prescriptions of Securities) (Digital Currency and Digital Token) Order 2019, which regulates all initial coin offerings (ICOs) and cryptocurrencies, came into force on 15 January 2019. It classifies cryptocurrencies and digital tokens or digital assets as securities. Without doubt, cryptocurrencies seem to be the most visible albeit controversial example of fintech. This further justifies the need to clarify the legal, regulatory and Shari'ah issues pertaining to such fintech applications.

Fintech is changing our lives for the better through unending technological applications in the finance industry. The daily lives of human beings, and even non-humans, are now tied to technological applications where robots have taken over the roles of financial advisors. While regulators and lawmakers try to catch up with the rapid developments in financial technology, it appears the rapid rate of development in the fintech sector is outpacing regulatory frameworks. This uncertain situation is more complicated in a niche industry such as the Islamic financial services industry, which has additional faith-based filters in its product-development process. This therefore makes a case for the need for thought leadership in relation to this uniquely important subject in order to guide policymakers, regulators, and practitioners on the dynamics of fintech in Islamic finance, and provide a good understanding of the Shari'ah and legal and regulatory parameters for fintech solutions.

A quick search of the available books on fintech reveals that one of the earliest publications on this subject was published in 2016. With the exception of a few books on fintech published in earlier years, most leading books on fintech were published in 2016 due to the novelty of the phenomenon.¹ It thus appears the academic response to practical applications in the financial technology industry is not as fast as the emergence of innovative fintech applications in different sectors

of the financial industry. This makes a case for the need for deeper studies beyond the discourse of the disruption of the banking sector which has dominated the whole idea of fintech in the past few years.

Fintech should be understood to cover all aspects of the application of technological advancement in delivering, facilitating, or enabling financial services. Therefore, fintech includes blockchain applications and other web-based services utilised in the financial services industry as well as offline-to-online (O2O) and Internet-of-things (IoT) applications. One could simply say the list is endless and such should be the general understanding of fintech rather than confining it to the most prevalent applications such as blockchain technology and cryptocurrencies.

Being a pioneering book in the field of fintech in Islamic finance, this book offers fresh and alternative ideas of fintech applications while addressing some socio-economic, legal and Shari'ah issues associated with such applications within the general purview of the Islamic financial services industry. While there has been too much emphasis on crowdfunding, cryptocurrencies and blockchain technology in the general discourse on fintech, this book provides additional areas of application within the transaction spectrum of Islamic financial contracts such as legal documentation, e-commerce and dispute resolution which is at the tail-end of the whole transaction process. For this, the book addresses online dispute resolution (ODR) and its relevance to Islamic financial transactions with specific reference to how such a mechanism could be applied under the existing legal and regulatory framework in Malaysia (Oseni and Omoola 2015).

Just like the conventional fintech landscape, the list of fintech applications or solutions in Islamic finance is endless. In fact, besides areas such as anti-money laundering and anti-terrorism financing and customer due diligence, fintech could also be applied to aspects of Shari'ah verification of transactions and robo-Shari'ah advisors. These unique aspects, which might not be necessary in the conventional application of fintech, necessitate the need to specifically address fintech from the Islamic finance perspective. This huge vacuum is what this book seeks to fill in its length and breadth.

Fintech in Islamic finance should be generally understood in a broad manner as Islamic financial services transcend mere banking. The Islamic financial services spectrum comprises of Islamic banking, Islamic insurance or *takaful*, Islamic capital market and Islamic money market. From the transactional perspective, the understanding of fintech in Islamic finance includes all aspects of a typical Islamic financial services transaction starting from the negotiation phase, credit scoring/checking phase, documentation phase, execution phase and up to the post-transaction issues such as managing defaults, addressing disputes and enforcement of contractual terms, judgements of the courts/arbitral tribunals or settlement agreements.

Current trends in fintech application

In an Ernst & Young Report titled *Banking in Emerging Markets: GCC Fintech Play 2017*, it was revealed that the private sector investment in fintech increased from

less than US\$3 billion in 2012 to US\$19 billion in 2015. This promising and disruptive technological innovation in the financial services sector is being considered as the future of the global financial system. Though the fintech aggressive revolution is said to enhance consumer value proposition in the financial services sector, one would also like to consider whether there is an additional proposition in infusing Shari'ah-compliant principles in the disruptive innovations to further enhance the consumer experience of a segment of the financial consumers who are biased towards Shari'ah-compliant financial services.

For the purpose of identifying the applicable Shari'ah principles, it may be helpful to define fintech in its general sense and identify its different components and applications. Therefore, adopting the Wharton Fintech Club definition, fintech may simply be referred to as “an economic industry composed of companies that use technology to make financial systems more efficient” (McAuley 2014). The Shari'ah principles will only apply to each of the components or applications after a careful study of the specific details rather than the generic term “Fintech”. This is why this book does not use the term “Islamic Fintech”, which is becoming popular among Muslim finance professionals. Although, from the branding perspective, “Islamic Fintech” appears to be more appropriate to demonstrate the uniqueness of fintech solutions in Islamic finance, it is preferable to use the terms “Shari'ah-compliant Fintech” or simply, “Fintech solutions in Islamic finance”. Giving fintech the “Islamic” label presupposes that it is truly Islamic – a feature which can only be determined upon obtaining a formal Shari'ah approval. After all, fintech is merely a means to an end and not the end itself; hence, it should not necessarily carry the full “Islamic” label.

Moreover, there is some sort of confusion in identifying what is and what is not of fintech. While there has been much emphasis on blockchain technology, there are other less complicated applications that may also fall under the general purview of fintech. This is probably why it is difficult to address all operational issues affecting fintech applications. The same thing is true for applicable Shari'ah principles. It might be difficult to address all Shari'ah issues relating to fintech, as this remains an evolving phenomenon whose components and features have not been exhaustively discussed. However, it is important to agree on what fintech entails through the identification of what it applies to. In this context, one could say fintech includes any technological application to financial services transactions from the negotiation stage through the documentation, execution and closing stages of the transaction, including matters connected to how disputes emanating from such transactions are resolved.

Understanding this book

With the complex fintech ecosystem, which according to a Fintech Report by PwC, has the following key players – financial institutions, tech companies, infrastructure players, start-ups, regulators and government, consumers and users, investors/incubators/accelerators – this emerging field requires close

scrutiny, regulation and consideration of applicable legal and Shari'ah principles. Emerging technologies and tools have undoubtedly disrupted the traditional financial tools, and, as such, Shari'ah scholars ought to be far ahead of such developments. Therefore, in order to address these issues, this book is divided into six distinct but related parts. After this Part I, the next part, Part II focuses on fintech and financial intermediation, while considering the unique opportunity fintech creates for Islamic finance development. Part III sets the Shari'ah parameters for fintech, which serves as a valuable guide to innovators and regulators alike. It also clarifies the position of Islamic law on cryptocurrencies such as bitcoin. Part IV examines the legal and regulatory issues in fintech, including the potentials of smart contract in Islamic finance.

Having set the Shari'ah and the legal and regulatory framework for fintech solutions in Islamic finance in the previous parts, Part V provides useful case studies on fintech applications in Islamic finance. It also provides potential use cases of fintech applications, which could be taken to the next level. Such significant discussion on case studies, which transforms concepts to real-time applications, will be useful for technopreneurs. Finally, Part VI provides some future directions and impact of fintech in Islamic finance.

Fintech and financial intermediation

Though some studies have raised some concerns on how fintech might potentially exclude a larger segment of the society from financial services, one may conversely argue that with the proliferation and penetration of mobile and internet connectivity across remote societies in developing countries, fintech will better enhance financial inclusion. However, what does fintech have to offer to a vulnerable segment of society which prefers Shari'ah-compliant financial services, and is thus self-excluded due to the non-availability of financial services that are in consonance with its religious ideals? This is where the discussion on fintech and its potentials for furthering the goal of Islamic social finance is germane.

It appears the original DNA of fintech, which relies on a group of participants and in some cases big data, is similar to the communal principles in Islam otherwise known as *ummah*, where social solidarity is paramount. The ability to mobilise funds for a common or communal cause through crowdfunding, which in some cases is more of donation or interest-free loans, presents a new mode of financing that mirrors the traditional Islamic principles of social finance. Therefore, one may ask whether fintech is a natural form of Islamic finance. A further question that may be addressed is whether the emergence of fintech and the increasing adoption of fintech solutions in Islamic financial services presents a unique chance to re-orientate Islamic finance and streamline its value proposition towards social finance.

From the social finance perspective, can fintech promote financial inclusion in Muslim majority countries? While some have argued that fintech will

further deepen the surge of financial exclusion, the rate of internet penetration and adoption of mobile technologies in most rural areas in Muslim countries presents a different scenario. Hence, it is believed fintech has the potential of promoting financial inclusion and has some inherent developmental objectives which will help promote the 17 Sustainable Development Goals (SDG) of the United Nations in Muslim-majority countries. It is pertinent to note that fintech in Islamic finance will not only be relevant in ending poverty and hunger, it will also help to improve health and education, make cities more sustainable, combat climate change, and protect oceans and forests. This social dimension to fintech in Islamic finance is important to emphasise the need to come up with Shari'ah-compliant solutions which can be funded through Shari'ah financing to promote sustainable development (Ansari et al. 2012; Bennett 2015). There are increasing interests in green financing which has seen the issuance of Green Sukuk in Malaysia based on the Malaysian SRI Sukuk Guidelines (Moghul and Safar-Aly 2014). Undoubtedly, Islamic finance has more areas of convergence with the socially responsible investment (SRI) movements than any other financing model (Oseni 2014), and automating such processes through fintech will help to emphasise and promote the social element in Islamic finance as it relates to the higher objectives of Islamic law (*maqāsid al-Shari'ah*).

Setting the Shari'ah parameters

What is unique about fintech in Islamic finance? Is fintech in Islamic finance different from the conventional fintech? What are the parameters for any new technological disruption in Islamic finance? As earlier highlighted, fintech goes beyond just cryptocurrencies, as it covers a wide spectrum of application of innovative technology in financial services. So, rather than confining the discussion to cryptocurrencies, other beneficial applications such as online crowdfunding platforms, e-commerce, smart contracts, blockchain technology and online dispute-resolution platforms for Islamic finance disputes may be less controversial. With emphasis on blockchain technology and the significance of smart contracts, Islamic banks may leverage on this for Islamic finance agreements that have the ability to self-execute, self-maintain, and self-enforce, thereby reducing uncertainties in dispute-resolution processes through litigation (Oseni and Omoola 2015; Koulu 2016; Watanabe et al. 2016a, 2016b).

The fintech universe is complex. As such, fintech applications may be grouped according to the financial market activities where they are applied. For payment, clearing and settlement, one may have the following applications: mobile, web and contactless payments, digital currencies and distributed ledger technologies. For deposits, lending and capital raising, one could have the following applications: peer-to-peer lending, marketplace lending and crowdfunding. Another category is market provisioning, which includes e-aggregators, smart contracts, Big Data and digital identity. Finally, for the investment management category, the following applications are prevalent: robo-advisor and electronic trading. All

these applications are regulated under the RegTech framework (Adams 2016: 3). These are just examples of prominent fintech innovations, which is a non-exhaustive classification. The implication of this is that Shari'ah scholars may need to come up with applicable principles on each innovation.

One key aspect of fintech which is conspicuously missing in the ongoing discussions and application of fintech in Islamic financial services and products is online dispute resolution (ODR). There has been an attempt to explore the relevance of ODR in Islamic banking generally and the prospects of such technological innovation in reducing the number of Islamic finance disputes going to the courts. In the model, which has been conceptually analysed and empirically tested, Shari'ah compliance of the settlement decision is emphasised to ensure the process and outcome are both driven by the same principles underpinning Islamic financial transactions (Oseni et al. 2018; Oseni and Omoola 2017).

When it comes to fintech solutions in Islamic finance, Shari'ah compliance is paramount and this should be based on the same principles applicable to commercial transactions with particular reference to the prohibited elements in commercial contracts and operations for financial services. The same general principles can be applied to specific instances. This will, however, require legal adaptation (*takyif fiqhi*) to address the peculiarities of fintech, as there are no precedents to these disruptive innovations (Shubayr 2004). This has been proposed recently by the Dubai Financial Services Authority (DFSA) which seeks to subject Shari'ah-compliant equity crowdfunding platforms to the original rules applicable to Islamic financial institutions.

A former Secretary General of the Islamic Financial Services Board (IFSB), Jaseem Ahmed (2017) summarised the importance of considering Shari'ah and regulatory issues while embracing the solutions fintech has to offer to the Islamic financial services industry:

From the Shari'ah perspective, there are two complementary principles at stake: first the principle that in *fiqh al-mu'amalat* innovations are allowed unless they fall under an explicit prohibition, and second, the rather detailed requirements of Islamic law for the validity of exchange contracts. Contractual uncertainty may pose a challenge in many Fintech cases.

At the same time, subject to conformity with Shari'ah principles, solutions from other FinTech areas such as blockchain and smart contracts may help to improve operational efficiency in Islamic finance. ... The Shari'ah compliance challenge is in identifying the perimeter of permissible innovation, when the formal requirements of classical contracts are not met, whilst elucidating the modifications that would permit access to the new technology on a Shari'ah-compliant basis.

These concerns in setting the Shari'ah perimeters of permissible innovations and applications are addressed in a systematic manner in this book by leading Shari'ah scholars.

One may ask how to apply Islamic *fiqhi* (jurisprudential) tools such as *hiyal* (legalistic trickery) and *markharij* (legal solutions in compliance with the spirit of Islam), *maslahah* (public interest), and *dhara'i* (blocking the means to evil) to new fintech-driven products, solutions, services and contracts. The question is whether we should wait for issues to emerge and mature or imagine and be prepared with a more suitable response. Issues have already emerged. There are some existing Shari'ah opinions, which some may consider "cursory" at this stage because the premise of such opinions is not generically based on in-depth scholarly research. While some scholars have declared, for example, cryptocurrencies such as bitcoin as impermissible, others have considered such innovations permissible. In fact, some proponents of some of the applications of fintech have resorted to fatwa shopping to get favourable rulings to support their online trading of bitcoin (Oseni et al. 2016). So, this is the time Shari'ah scholars should come up with informed scholarly opinions on specific issues. With particular reference to cryptocurrencies and the seeming revival of Islamic dinar and dirham, Shari'ah scholars may come up with informed opinions to prevent abuse of the common naivety in most Muslim communities where there is always the tendency of manipulating people's beliefs for marketing purposes. Over the past few decades, one has seen the different dimensions of faith or *taqwa* premium in marketing Shari'ah-compliant products and services in many jurisdictions, particularly in western societies (Khan 2014).

There is what is called "Islamic Cryptocurrency E-Dinar Coin" online and Muslims are being encouraged to join the bandwagon. In this specific case study, there is an interest rate of up to 0.65 per cent to be paid daily. These are areas leading Shari'ah scholars may scrutinise to guide the unsuspecting and naive Muslim investors.² Such practices therefore make a good case for an authoritative text that will guide policymakers, unsuspecting investors, students, as well as regulators on key Shari'ah and legal parameters in the application of fintech solutions in the Islamic financial services industry.

From the Shari'ah perspective, *maqāṣid al-shari'ah* will continue to be relevant in fintech, as the *maslahah* provided by the new technologies trumps any other argument that seeks to preserve the traditional financing methods. Therefore, when there is a conflict between public interest and private interest, the former will prevail as established by the early Muslim jurists (Kamali 2009). This makes a case for the adoption of fintech in Islamic commercial dealings.

In addition, how do we consider the *maslahah* in robo-advisors for portfolio management? More importantly, what is the value of Shari'ah robo-advisors or robo-advisors for Shari'ah-compliant products? (Andrus 2014; Hougan 2015). This might pose significant legal, operational, reputational, and Shari'ah risks to Islamic financial transactions. Can investors trust robots to render better investment advice in Shari'ah-compliant transactions? Can we replace Shari'ah officers in financial institutions with robots? This would have some implications for consumer protection laws and agencies. Therefore, a *maslahah* determination of fintech should consider the imperativeness of legal and regulatory framework to

avoid market abuse which is currently being experienced in some cryptocurrency applications. Important points to consider here include the following:

- (i) For cryptocurrencies, who determines the legal tender in a particular jurisdiction? Legal tender should ordinarily be determined by a constituted authority in a particular jurisdiction. Public interest overrides individual interest in this case (Hasan 1971). Therefore, all forms of cryptocurrencies should be regulated in each jurisdiction to avoid abuse, fraud and financial misconduct which may lead to money laundering and terrorism financing.
- (ii) *Sadd al-Dhari'ah*, or blocking the means to evil, may be invoked to avoid associated harm in some of the fintech applications, particularly cryptocurrencies.
- (iii) Necessary safeguards should be put in place to avoid operational failures where the data of investors are compromised.
- (iv) There is a need to consider the effect of hacking of the blockchain technology applications and the effect of such on the funds invested by the people. Shari'ah and legal scholars may introduce a strict liability regime to protect the investments.

Legal and regulatory framework for fintech

Leaving fintech without regulation or robust legal framework will render the whole disruptive innovation susceptible to abuse, misuse and devastating manipulations. Therefore, regulatory technology or RegTech may have to step up its proactive regulations to regulate fintech applications. Beyond RegTech, there is a need for regulatory guidance for the application of fintech in financial services as recently experienced in Malaysia with the enactment of the Capital Markets and Services (Prescriptions of Securities) (Digital Currency and Digital Token) Order 2019.

On 31 March 2016, the Office of the Comptroller of the Currency (OCC) of the United States released a White Paper that outlines its support for responsible innovation in the country's federal banking system. The OCC defines "responsible innovation" as:

The use of new or improved financial products, services, and processes to meet the evolving needs of consumers, businesses, and communities in a manner that is consistent with sound risk management and is aligned with the bank's overall business strategy.

(Curry 2016)

This recognises and acknowledges the OCC's receptivity to innovative solutions such as fintech as long as they uphold sound risk management and corporate governance principles, and comply with relevant laws and regulations, and protect consumer rights.

In evaluating the innovative products and services offered and/or performed by banks, the OCC formulated eight principles which mirror its perspective of fintech solutions. Therefore, the OCC would:

Support responsible innovation, Foster an internal culture receptive to responsible innovation, Leverage agency experience and expertise, Encourage responsible innovation that provides fair access to financial services and fair treatment of consumers, Further safe and sound operations through effective risk management, Encourage banks of all sizes to integrate responsible innovation into their strategic planning, Promote ongoing dialogue through formal outreach, and Collaborate with other regulators.

(Curry 2016)

These principles are quite important in a global financial industry that experienced economic meltdown barely a decade ago and the ability of fintech innovations to effectively navigate strict financial laws and regulations in different jurisdictions. While it is important to create room and accommodate start-ups through fintech, consumer protection laws must be strengthened, and relevant laws and policies must be put in place to avoid an unprecedented devastating financial crisis.

From the Shari'ah perspective, financial issues that have significant impact on people's lives and the overall economy cannot be left entirely in the hands of individuals. The state may step in to regulate an industry to ensure financial stability and consumer protection, particularly when unsuspecting investors may be the subject of financial abuse. The Islamic concept of *hibsah* which saw the introduction of the office of *muhtasib* (or ombudsman) in the early days of Islam is a testimony to this assertion (Rashid 2004). The *muhtasib* regulated the market and ensured financiers as well as vendors complied with the rules to avoid any business misconduct that would negatively impact the public (Abdul Hak et al. 2013). Such practice may be replicated in the modern application of fintech innovations in the Islamic financial services industry. For instance, as discussed earlier, individuals may not be legally empowered to determine the medium of exchange through cryptocurrencies. The constituted authority in the state may need to set the minimum regulatory standards as being experienced in some jurisdictions such as Singapore, the United States, and more recently, Malaysia.

Current and potential applications of fintech in Islamic finance

While the specific scope of fintech cannot be identified generally, as new innovative solutions for financial services keep springing up, one thing that remains constant in the analysis is that fintech has the potential to apply to financial services regardless of the nature and type of such services. For Islamic finance,

the application of fintech covers the conventional scope as well as certain unique aspects such as Shari'ah advisory, ethical screening, and structuring of partnership products that are uniquely Shari'ah compliant. As earlier observed, the application of blockchain technology and the internet platform or in general terms, the information and communications technology (ICT) revolution in Islamic financial services covers the whole spectrum from the negotiation phase up to post-execution matters such as dispute resolution, including litigation and arbitration, enforcement of awards and/or judgements of the court, defaults, debt restructuring, etc.

The most innovative application and disruptive application of fintech in the Islamic financial services industry, which is gradually gaining momentum and generating series of Shari'ah debates and regulatory unclarity, is cryptocurrencies. As discussed earlier, despite the emergence of cryptocurrencies such as E-Dinar Coins, there are still unresolved Shari'ah and regulatory issues that require in-depth research as highlighted earlier and as discussed in the relevant sections of this book. Setting the Shari'ah parameters for these kinds of disruptive innovations goes beyond mere *halal* (permissibility) and *haram* (prohibition) from the strict Shari'ah perspective. There are other aspects such as Shari'ah public policy considerations, regulatory aspects, and the associated abuse and misuse of such innovations in an increasingly interconnected world.

For the current applications of fintech in the Islamic capital market, there has been a significant increase in the adoption of technology and innovative solutions in leading jurisdictions offering Islamic financial services. For instance, in Malaysia, the Investment Account Platform (IAP) was introduced as a cross-border multi-currency platform for facilitating regional and global financing opportunities for emerging business ventures. The IAP is based on a consortium of several Islamic banks who help as financial intermediaries to channel the funds to deserving business ventures.

Similarly, there have been other innovative solutions in Malaysia for liquidity management such as the Bursa Suq Al-Sila (BSAS) online platform for managing commodity *murabahah* transactions (Saiti et al. 2016). The platform provides a Shari'ah-compliant trading mechanism for facilitating *tawarruq* (monetisation) and *murabahah* transactions online which is a seamless and fast process of concluding the applicable strings of transactions. This pioneering end-to-end Shari'ah commodity trading platform was introduced as far back as 2009 and has since won global attention with the increasing use of the platform across borders. There is an increasing acceptance of the platform from participants across borders from different jurisdictions, particularly in the Middle East and North African and Asian regions. This has led to an annualised growth of 178 per cent in the use of the online platform for *murabahah* and related transactions between 2009 and 2014 (MIFC 2016).

In the United Arab Emirates, the Dubai Multi Commodities Centre (DMCC)'s Commodity Murabahah Trading Platform (CMTP) became fully functional in 2013. The CMTP adopts the tradable warrants model by enabling

transfer of ownership and possession through the online platform. Similar to the BSAS, the CMTP is a fully electronic platform for commodity *murābahah* transactions and it is Shari'ah compliant. While addressing all possible Shari'ah concerns, the platform provides the means to ascertain the existence of the underlying commodities and inspection by relevant parties to the transaction prior to final execution of documentation and conclusion of trade, verification of the underlying warrants to ensure that they are legally recognised documents, and a retrievable document trail with standard audit capabilities for both conventional and Shari'ah audit functions (Nazir 2013). A similar innovative solution for Islamic financing through *wakālah* (agency) investments as underlying assets is the Nasdaq Dubai Murabahah Platform. The online platform provides a seamless, easy, and fast solution for Islamic banks who offer financing to customers.

Beside this application of fintech in Islamic capital market, there is increasing use of crowdfunding platforms for financing of Shari'ah-complaint projects, particularly for small and medium-sized enterprises (SME), housing, and agricultural financing. A few of such case studies are provided in this book while other potential use cases are also discussed. Some of the innovative solutions discussed in this book include EthisCrowd, the IAP, Blockidentity, and WaqfCoin. This practical and professional dimension in the discussion of fintech in Islamic finance makes this book not only relevant for academics but also makes it an important handbook for practitioners who wish to expand and extend the frontiers of fintech applications or replicate the existing solutions in different jurisdictions.

Furthermore, fintech has engineered rapid developments in the mobile-payments space across the world. In fact, in some developing countries like Kenya, mobile payments have enhanced financial inclusion as more rural people have access to financial services. While this promising financial technology solution has been widely adopted in different forms, there is a need to examine specific legal and Shari'ah issues in its application with a view to guide consumers who are religiously inclined to Shari'ah compliance.

Conclusion: Future impacts of fintech in Islamic finance

While fintech applications in the banking and capital market sectors have been widely acknowledged, there has not been much focus on what we may refer to as *Taktech* or *takāful* technology. This is a Shari'ah-complaint variant of the conventional insurtech. Taktech, being a subset of fintech in Islamic finance that combines the word "*takāful*" and technology, seeks to revolutionise the takāful sector by complementing existing initiatives to extend *takāful* to the underinsured segments of the population. Taktech is the latest buzzword that specifically refers to the application of technology in different aspects of Shari'ah-compliant insurance schemes or *takāful* to complement existing practices, enhance financial inclusion, serve the underinsured, and promote best practices in service delivery to policy holders or participants.

Finally, it appears there has been too much emphasis on the technological part rather than to the financial component of fintech. This is why most frameworks have not really seen the relevance of Shari'ah and its hermeneutic principles in fintech applications. While it might not be necessary to come up with terms such as "Islamic Fintech", the deployment of fintech applications for Islamic financial services and products should not only be properly regulated under the laws of different jurisdictions but emphasis should also be placed on Shari'ah governance. Regardless of the numerous advantages inherent in fintech applications, its significant regulatory challenges remain a major concern in the global Islamic financial services industry.

NOTES

Chapter 1

- 1 Such books include *The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries* (Chishti & Barberis), *FinTech Innovation: From Robo-Advisors to Goal Based Investing and Gamification* (Sironi), *Fintech: The Impact and Influence of Financial Technology on Banking and the Finance Industry* (Hayen), *Bankruption: How Community Banking Can Survive Fintech* (Waupsh), *Innovation in Banking: Why FinTech challenges traditional business models and how this affects German retail banking* (Sprengel), *Financial Technology: Fintech, Blockchain, Smart Contracts* (Reed), *FinTech: The Beginner's Guide to Financial Technology* (William), *Blockchain: Blockchain, Smart Contracts, Investing in Ethereum, Fintech* (Reed).
- 2 For more information on E-Dinar, see <https://edinarcoin.com/faq-en/>

Chapter 3

- 1 www.eifb.ae/eifb-en/
- 2 www.inceif.org/the-centre-for-islamic-wealth-management/overview/
- 3 www.sc.com.my/wp-content/uploads/eng/html/icm/ifwm_blueprint_170112.pdf
- 4 www.ibfim.com/
- 5 www.ethiscrowd.com/
- 6 <https://kapitalboost.com/>
- 7 www.launchgood.com/#/

Chapter 6

- 1 http://ocw.metu.edu.tr/pluginfile.php/352/mod_resource/content/0/Lecture_3.pdf

Chapter 11

- 1 <https://g7.gc.ca/en/official-documents/charlevoix-common-vision-future-artificial-intelligence/>

Chapter 13

- 1 For statistics on bitcoin and other cryptocurrencies see <https://bitinfocharts.com>.
- 2 For more details see <https://digiconomist.net/bitcoin-energy-consumption>.
- 3 See also https://en.bitcoin.it/wiki/Proof_of_Stake.
- 4 Bitcoin has a maximum speed of 7 transactions per second, Ethereum around 20, PayPal processes on average 193 payments with a peak of 450, and Visa has reported 1,667 transactions per second as the average of 2016 and 56,000 transactions as a possible maximum (Vermeulen 2017).
- 5 It may be that one site is the target of links from more than one of its successors.
- 6 Another exception is the first site which cannot send any arrows forward.
- 7 “Cryptokitties are feline blockchain-based collectible units ... that can be bred (created) and traded (bought-or-sold) on an ethereum blockchain. Launched in October, 2017 ... the game has garnered more than \$10 million dollars worth of trades, with feline units of Cryptokitties amounting to \$100,000 or more in value ... The average sales price, however, is roughly \$100 per kitten. ... The popularity of Cryptokitties has in fact put bandwidth pressure on the entire Ethereum network, at occasions drawing more than 10% of the network bandwidth” (Cohan 2017: 2).
- 8 The website www.stateofthedapps.com/ lists close to 1,800 DApps designed for Ethereum (as of 9 August 2018) of which more than 730 fall into the categories “games” and “gambling” while 550 are classified as “exchanges” and “finance”. Not all designed DApps will finally be launched.
- 9 Source of data (also 2018 data later in this paragraph): www.coindesk.com/ico-tracker/.
- 10 “A recent study, based on publicly available information and sources, claims that nearly 80 percent of the initial coin offerings (ICO) are scams, and only a meager 8 percent of the floated ICOs manage to reach the trading stage on the various cryptocurrency exchanges” (Seth 2018).
- 11 www.masjidramadan.org/donate.php. The website does not provide any information on the zakâtability of bitcoin holdings and, if zakâtable, on the appropriate *zakât* rate.
- 12 On specificities of the Ethereum transaction fees – “gas” – see tomshwom 2017.
- 13 www.cryptokitties.co.
- 14 “It is ... possible that one or more partners run the business while the rest may not participate. Partners are considered agents for each other whereby an action done by one of them in the ordinary course of business binds other partners” (Saleem 2013: 99).
- 15 For a “formula-free” survey of the basics of the most commonly used types of predictive models see Finlay 2014; for a kind of “formula-loaded” textbook see Larose and Larose 2015; for a summary of analytical platforms in an IT perspective see Skyrius et al. 2017.

Chapter 14

- 1 The calculation is based on the assumption that the market will grow by 1.2 per cent cumulative annual between 2014 and 2016.
- 2 Based on the assumption that the share of Islamic trade finance transactions remained the same as in 2014.
- 3 453 F.2d 533 (10th Cir. 1972).
- 4 *Newton v. Merrill, Lynch, Pierce, Fenner & Smith, Inc.* 135 F.3d 266, 269 (3d Cir. 1998).

Chapter 18

- 1 General Data Protection Regulation (GDPR) is a regulation in European Union law on data protection and privacy for all individuals within the EU and the European

- Economic Area (EEA). It was made on 14 April 2016 and implemented with effect from May 25 2018.
- 2 Quran 2 verses 275 and 276 are two key verses establishing them as core principles.
 - 3 Know Your Customer (alternatively, Know Your Client or “KYC”) is the process of a business verifying the identity of its clients and assessing potential risks of illegal intentions for the business relationship. The term is also used to refer to the bank regulations and anti-money laundering regulations which govern these activities (De Smet and Mention 2011). Know Your Customer (KYC) is governed by numerous regulatory provisions across various financial jurisdictions.
 - 4 In the words of Malaysia’s Communications and Multimedia Minister Gobind Singh Deo: “We feel if we can formulate a digital ID, it would make it easier to market goods on e-commerce platforms and expand the industry further.”
 - 5 CP – Claiming Party in an identification process.
 - 6 RP – Relying Party in an identification process.
 - 7 Identity claims consist of the user’s attributes (for example, name, date of birth, nationality, occupation and so on), which are stored in text and object fields (JSON-LD blobs). For convenience and efficiency, the platform is equipped with an optical character-recognition feature that will automatically parse the information from photos or scans of documents.
 - 8 First, all US states were authorised to accept some form of e-notarisation in conformance with the Uniform Electronic Transactions Act (UETA) which was approved in 1999 by its National Conference of Commissioners on Uniform State Law (NCCUSL) as an overlay statute to help reconcile conflicting state laws. Second, the Electronic Signatures in Global and National Commerce (ESIGN) Act was passed in 2000 by the federal government and grants legal recognition to electronic signatures and records if all parties to a contract choose to use electronic documents and to sign them electronically, and it also supports e-notarisation.

Chapter 19

- 1 BNM is the Central Bank of Malaysia. It was established under Central Bank of Malaysia Act 2009 (CBA), which came into force on 25 November 2009. The Act repealed the Central Bank of Malaysia Act 1958. The main function of BNM is to provide greater clarity to the Bank’s mandates on promoting monetary and financial stability, and to exercise oversight over payment systems.
- 2 The Payment System Act 2003 (PSA), now repealed, provided for an oversight regime for compulsory corporate governance for both operators and issuers of designated payment instruments, which include e-money, credit card and charge card. A critical examination of the PSA’s provision shows that the legislation does not provide for any form of dispute resolution framework but is intended to complement the operational arrangement of payment service system providers. With the coming into force of IFSA 2013 (regulates the Islamic financial services industry) and FSA 2013 (regulates the conventional financial services industry), all the relevant provisions regulating payment systems in the PSA have been incorporated into the new laws.
- 3 Sukuk commonly refers to the Islamic equivalent of bonds. As opposed to conventional bonds, which merely confer ownership of a debt, Sukuk grants the investor partial ownership or share of an asset, along with the commensurate cash flows and risk.
- 4 Malaysian Electronic Payment System (MEPS) is a payment consortium owned by the domestic financial institutions, including those offering Shari’ah-compliant products, to promote the sharing of banking infrastructure. One special feature of MEPS is the Shared ATM Network (SAN) switch, which enables participating banks’ customers to access their account through over 20 participating domestic financial institutions and international partners mainly in Southeast Asia.

5 Section 138 IFSA 2013 provides for the Financial Ombudsman Scheme, which is an apparent enabling provision for any dispute resolution initiative, including the ODR mechanism for Islamic finance disputes. The clear provisions of section 138 are reproduced verbatim here:

- (1) For the purposes of ensuring effective and fair handling of complaints and for the resolution of disputes in connection with financial services or products, regulations may be made under section 271 to require any class, category or description of financial service providers
 - (a) to be a member of a financial ombudsman scheme approved under subsection (2); and
 - (b) at all times, to comply with terms of membership of such scheme.
- (2) The Bank may approve any financial ombudsman scheme for the purposes of paragraph (1) (a).
- (3) Regulations may be made under section 271 for the purposes of ensuring that a financial ombudsman scheme is fair, accessible and effective, including regulations on the following:
 - (a) the matters that the Bank may have regard to in determining whether to approve a financial ombudsman scheme under subsection (2);
 - (b) the functions and duties of, or other requirements to be complied with by any person operating a financial ombudsman scheme;
 - (c) the terms of a financial ombudsman scheme setting out the scope, including types of dispute that may be referred to it and its eligible complainants, membership requirements, application, operations, procedures, the fees that may be charged and the types of award which may be granted under the financial ombudsman scheme;
 - (d) appointment of directors of any person operating a financial ombudsman scheme;
 - (e) the documents or information that shall be submitted by any person operating a financial ombudsman scheme to the Bank; and
 - (f) withdrawal or suspension of an approval under subsection (2).
- (4) A financial service provider, who is a member of a financial ombudsman scheme, approved under subsection (2), shall—
 - (a) provide documents or information as may be required for the purposes of the resolution of disputes referred to the financial ombudsman scheme; and
 - (b) comply with any award granted under the financial ombudsman scheme, including a direction that requires the financial service provider to take such steps in relation to a dispute.

Where a dispute has been referred to a financial ombudsman scheme by an eligible complainant the eligible complainant is not entitled to lodge a claim on such dispute with the Tribunal for Consumer Claims established under the Consumer Protection Act 1999 [Act 599].

6 Since 1997, laws have been passed in Malaysia to enable the deployment of innovative technology in the running of different apparatus government and the economy. These laws are two-fold: first are legislations which have focused on legal recognition, security and privacy of online commercial transaction and communications. The most recent among such legislations are:

Digital Signature Act, 1997

Computer Crimes Act, 1997 Copyright (Amendment) Act, 1997 (also read Copyright Act, 1987) Telemedicine Act, 1997

Communications and Multimedia Act, 1998

Communications and Multimedia Commission Act, 1998

Personal Data Protection Act, 2010

While the E-Commerce Act 2006 did not provide for any dispute resolution mechanism, the Sale of Goods Act 1957 and the Contracts Act 1950 is deemed to be the prescribed law for seeking judicial remedy in the event of e-disputes under this Act.

7 Rehn writes:

I would like to remind you that the Ombudsman is an intellectual gift from Turkey to modern democracies. Swedish King Charles the Twelfth admired the functioning of this Ottoman institution during his time travelling in Turkey in the early eighteenth century. He established the office of His Majesty's Supreme Ombudsman in Sweden by signing an ordinance in Timurtas, just south of Edirne, in 1713. Now it is time to re-import this excellent institution back to Turkey, after it has undergone several centuries of product development in various other European countries.

(See Olli Rehn, 'Turkey and the EU: A Win-Win Game' (2008) 7 *Turkish Policy Quarterly* 19, 20; Stephen Hurwitz, 'Denmark's Ombudsman: The Parliamentary Commissioner for Civil and Military Government Administration' [1961] *Wis. L. Rev.* 169, 224–243)

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