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Opinion Mining of Islamic Financial Technology Providers: An NLP Approach

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ABSTRACT
This paper aims to investigate users' opinions regarding Islamic Fintech services providers. The paper adopted the secondary data available in the form of published papers in research journals along with the Fintech users reviews posted on different Fintech applications on Google Play Store for achieving the paper objectives. The paper also focused on research papers centered on opinion mining of Islamic fintech. The analysis highlighted seven relevant papers, revealing positive, neutral, and negative sentiments on various social media platforms. Further, the data collected from the Google App Store on Islamic fintech apps analyzed for sentiment polarity employing an NLP approach. The results show that 83.1% of users have positive sentiments, 2.0% have negative sentiments, and the remaining 14.1% are neutral. The research paper proposed that future studies utilize technology acceptance models to understand why consumers have varying sentiments about Islamic fintech.

Keywords: Opinion Mining, Sentiment Analysis, Islamic Fintech, Machine Learning

Introduction

Islamic law prohibits riba (interest) and encourages risk-sharing (Iqbal & Mirakhor, 2011). This differs from the capitalist or traditional finance model, which maintains that riba (interest) is essential for the economy (Lucas et al., 1985). As per the statistics shown by Wordometer (2024), currently, the world population is 8.1 billion, out of which around 1.5 billion are Muslims who need financial services as per their religious guidelines. Once they know the system's beauty and effectiveness, non-Muslims enjoy using Islamic financial services (Mohd et al., 2020). As mentioned earlier, Islam denounces interest and promotes risk sharing; similarly, it prohibits speculation, gambling, hoarding, and investments in products that are unlawful according to Islamic

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law. In its traditional, capitalist, or conventional form, finance does not need to abide by such injunctions, which is the main difference between Islamic and traditional finance. Islamic finance comes with built-in guidelines derived from the Quran and Sunnah.

The notion of financial technology gained momentum after the world financial crisis in 2008, and the recent pandemic pushed it, making it the need of the hour. Technological advancements such as the internet, artificial intelligence, cloud computing, SAAS, distributive ledger technology, and digital devices have revolutionized the provision of Islamic financial services to customers (Hassan et al., 2022). Embedding Islamic business and economic principles with technological innovations creates a distinct subset of the financial technology sector known as Islamic or Shariah financial technology (I-fintech). Fintech is a portmanteau of 'financial technology' and represents an industry composed of companies that use technology to make Islamic financial services more efficient and accessible. The term "portmanteau" refers to a sizable travel bag that unfolds into two identical sections, a concept applied by (Gomber et al., 2018) to the word "fintech." This term is prevalent in the finance industry to denote financial services that leverage contemporary technology. Businesses in this industry apply age-old religious principles through cutting-edge technologies to meet the financial needs of the modern Muslim community in a Shariah-compliant and efficient manner.

In the past decade, there has been a plethora of research studies focused on Islamic financial technology. The literature surrounds Islamic financial technology from various aspects, such as the factors responsible for determining consumers' use or adoption of I-fintech services (Ajzen & Fishbein, 2019), the barriers faced by I-fintech, and the opportunities available to I-fintech startups (Firmansyah & Anwar, 2019), research on the use cases of Islamic fintech products and services (Hassan et al., 2020; Rabbani et al., 2020a). Awotunde et al. (2021) imagine that Islamic fintech will catalyze digital transformation and contribute to sustainability within the Islamic finance industry.

Islamic financial technology (I-Fintech) is a techno-driven financial innovation rooted deeply in Islamic laws and principles, opening doors for the underbaked and unbaked populous to access financial services efficiently and effectively (Alwi, 2018). Its emergence has created significant financial inclusion opportunities in developing economies, including Pakistan. The ways of rendering financial services have been significantly altered due to the emergence of cutting-edge technologies such as blockchain, artificial intelligence, cloud computing, etc., and the Islamic finance arena is not immune to these innovations. Islamic Fintech has stridden across Islamic and non-Islamic economies and has appealed to millions of unbanked masses globally. Lippka (2023) assigns this speedy diffusion of Islamic Fintech to the recent Coronavirus pandemic and the advancement in financial technology. As argued by Thakor (2020), the objectives of Islamic fintech are in harmony with the fundamental goals of Islamic law (Shariah law) and the higher objectives of Shariah; it becomes essential to have a thorough investigation of the complexities of this rapidly growing industry.

Literature review

The Evolution of Finance through Technology

The Oxford Dictionary defines financial technology (Fintech) as computer programs and technologies that facilitate or supply banking and financial services. The acronym Fintech is formed from the words finance and technology. Generally, it conducts business with financial services firms with technologically advanced offerings, frequently leading to groundbreaking, disruptive, and innovative services. Finance technology advances the financial sector by introducing a novel component. Fintech

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initiatives are revolutionizing the financial sector by migrating from physical locations to cloud-based platforms, enabling underbanked and unbanked individuals to access and utilize efficient financial services.

As defined by Schueffel (2017), after a thorough analysis of two hundred and three related research papers, fintech is the usage of technologies to enhance and expedite the rendition of financial services, consequently structuring an innovative sector across the financial arena. This definition is in harmony with other interpretations, such as The National Digital Research Center (NDRC), which defines financial technology as novel financial services in collaboration with modern technologies. According to Santi (2017), fintech use cases include financial activities such as payments, investments, lending, transfers, financial planning, etc.

Examples of fintech applications encompass various financial transactions like payments, investments, transfers, borrowing, comparison of financial products, and financial planning (Santi, 2017). Aaron et al. (2017) add another perspective and state that fintech is a techno-driven solution to solving economic problems. Furthermore, Muzdalifa et al. (2018) define fintech as a sector comprising enterprises leveraging technology to enhance the efficiency of financial systems and services.

The fintech sector gained more traction from consumers, regulators, and industry participants in 2014. The term since then has evolved to include a large and rapidly growing business sector, with investments ranging from US$ 12 billion to US$197 billion from 2014, depending on whether one considers only start-ups or the entire financial technology industry (Arner et al., 2015). The fast expansion of the fintech industry has naturally resulted in heightened regulatory examination, which is justified considering fintech's vital role in finance and its foundational infrastructure (Aalbers, 2018).

Today, fintech is seen as a recent marriage of finance and technology and is perceived as a modern phenomenon. Nevertheless, the interplay between finance and technology, as described by (Arner et al., 2015), has a long-standing history, and the developments in both sectors are closely intertwined and mutually reinforced. Another turning point behind the fintech evolution was the Global Financial Crisis (GFC) in 2008, which transformed fintech into a new paradigm (Ajzen & Fishbein, 2019; Clements, 2019). While studying fintech evolution, it is pertinent to consider the main three eras. From approximately 1866 to 1967, although in slight collaboration with technology, the financial services landscape industry was seen as an analog industry, a period scholarly characterized as fintech 1.0 (Arner et al., 2015). The transformation of the finance analog industry to a digital one started in 1967, mainly in communication and transaction processing. Consequently, by 1987, at least in the developed world, the financial services industry had become highly digitalized. This period lasted until 2008 and was known as fintech 2.0. By then, fintech was mostly used by the traditional financial industry, utilizing technology to render financial products and services. Since 2008, the FinTech 3.0 era has begun shifting the dynamics of financial technology. During this period, new start-ups and established techno companies emerged to deliver financial services directly to businesses and the general masses, posing a challenge to traditional financial institutions (Ajzen & Fishbein, 2019).

The beginning of Industry 5.0, which leverages advanced technologies such as blockchain, crypto, and the metaverse in the financial sector, has revolutionized global fintech practices. A prime example of this transformation is the rise of cryptocurrency investment in decentralized finance markets. In recent years, academic literature has explored various aspects of fintech (Jiang et al., 2022), the Internet of Things in financial

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services (Bansal, 2020), disruptive innovation in financial services (Arnaut & Bećirović, 2023), and algorithmic trading (Arumugam, 2023). Pakistan has witnessed a mild growth in the fintech industry, attracting many businesspeople (Rehman et al., 2023). The potential for fintech in Pakistan is immense, as it can address pressing needs that traditional financial institutions have been unable to fulfill. Moreover, the country's high level of mobile penetration has created numerous opportunities for the fintech industry to flourish (Khizar & Siddiqui, 2021). As the sector continues to evolve and expand, fintech is expected to play an increasingly significant role in shaping the future of finance in Pakistan and beyond.

The significance of Financial Technology (Fintech)

The marriage of finance and technology (Fintech) has restructured the utilization of financial services and their delivery globally (Yoon et al., 2016). According to the literature, fintech is an innovation that is expected to revolutionize the financial sector. Various financial institutions are making significant investments to bring forth novel technologies that have the potential to bring a paradigm shift in consumers' lifestyles. Such a paradigm shift is expected to provide consumers with a better user experience and seamless and speedy banking services anywhere and anytime. As mentioned (Prima, 2019), Fintech has the potential to catalyze the growth of technology in businesses, which will decrease transaction costs, increase economic development, and help create new job opportunities. Such an economic push will consequently benefit the living standards of people and will bring forth positive effects on the economy. As stressed earlier, fintech is essential in developing micro, small, and medium enterprises (MSMEs), the backbone of Pakistan's economy. Literature suggests that increased access to fintech services positively affects the capital development of MSMEs (Pranata et al., 2024). The services provided by financial technology, such as product selection guidance and support in financing, are crucial to facilitating the growth of MSMEs. As technology advances, MSMEs should leverage the increased accessibility and facilities provided by fintech companies to optimize their capital development. Fintech has evolved to be essential for developing the financial sector worldwide. As reported by (Liu & Chu, 2024), fintech can influence economic development. Similarly, a comprehensive research study (Song & Appiah-Otoo, 2022)studied the connection between economic growth and fintech across 31 provinces in China. They observed a significant positive impact on economic development. They also examined the relationship between the diffusion of fintech and GDP per capita in 137 economies and observed that the dissemination of fintech positively impacted the GDP per capita.

Innovation has a crucial role in the sustainable growth of an economy. It acts as a critical factor to enhance the competitiveness of a business in the financial sector (Liu & Chu, 2024). It paves the way for inventive business models instead of traditional financial institutions, influencing various actors within the economic ecosystem. Usually, the rendering of financial services depended upon physical channels with motor and break structures of physical buildings with large infrastructures having increased operational costs, reduced productivity, and suboptimal human resource utilization (Rehman et al., 2023). Nevertheless, the arrival of innovative ways of providing financial services with fintech has improved the user experience of consuming these services with the help of mobile devices, including smartphones, tablets, and computers. Additionally, the financial industry leverages core technologies like cloud computing and big data to analyze vast amounts of data, enabling a deep understanding of consumer needs and facilitating the delivery of efficient and comprehensive financial services (Arner et al.,

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2015). As a result, FinTech has revolutionized the financial industry, and the development of the financial market has significantly impacted countries' economic growth, leading to increased investment in FinTech by both firms and governments.

Islamic Financial Technology

Likewise, Islamic Financial Technology is the marriage of Islamic Finance and technology. Islamic fintech mandates that a product or service originating from fintech should abide by the rules of Islamic law known as "Shariah." Islamic fintech harnesses revolutionary technology like artificial intelligence (AI), big data, smart contracts, blockchain, the Internet of Things (IoT), and cloud computing to render the services of Islamic finance in a more transparent and sophisticated manner that is effective and efficient. The business activities of Islamic fintech encompass novel business models to enhance financial, social, and environmental objectives, including improved services across all Islamic financial services and product performance, as well as broader benefits like financial inclusion, poverty alleviation, and social justice. By enabling greater access to Islamic financial services in cheaper, easier, and more efficient ways, Islamic fintech provides opportunities for financing, payments, and investments aligned with the intended objectives of the Islamic Divine Laws (Maqasid Al-Shariah). In a nutshell, Islamic fintech employs all the required elements of technology in line with Shariah, which can alter the burdensome process bottlenecks and increase the issuance of funds to the underbanked or the unbanked segments of an economy.

The global landscape of Islamic Fintech

DinarStandard, a leading Islamic economy management consultancy, and Elipses, a leading ethical digital finance advisory and investment firm, collaboratively publish the Global Islamic Fintech Report. The report states that in 2023, the global market size of I-Fintech transactions was US$ 138 billion and is expected to grow at a CAGR of 17.3%, reaching US$ 306 billion by 2027. In contrast, the conventional Fintech sector is expected to witness a CAGR of 12.3% over the same period. The report furthers that Saudi Arabia remains the largest economy in terms of transaction volume, followed by Iran, Malaysia, UAE, Indonesia, and the UK. These economies make up the top five global list regarding I-fintech transaction volume. The report states that these top five countries are the most conducive to cultivating an Islamic Fintech ecosystem in their respective economies. The reports evaluated these economies by surveying I-fintech professionals through an index containing 19 indicators across each country's five categories: Talent, Regulation, Infrastructure, Islamic Fintech Market and ecosystem, and Capital. The report further presents an I-fintech hub analysis and states that Pakistan, Qatar, Turkey, and Bahrain are rapidly growing ecosystems.

The report claims that there are currently 417 Islamic Fintech firms globally. Some of these mature firms have made significant steps towards scaling up their business. The developed players in the market are paving the way for the up-and-coming Islamic Fintechs with diversification, consolidation of products, bigger funding rounds, and global expansion. Following are some of the leading players in the Islamic Global Fintech Arena.

Use cases of Islamic Financial Technology (I-Fintech)

Beehive is a P2P Islamic Fintech platform headquartered in UAE. This platform helps Small and Medium Entrepreneurs fulfill their business needs by allowing them to generate returns higher than savings in a risk-sharing atmosphere. They work closely

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with Islamic Finance products and services experts to design product structures that will enable Shariah-compliant investments. Its CEO, Craig Moore, states that all businesses campaigning on Beehive are evaluated to ensure that the business activities and the use of funds abide by the Shariah law. Beehive has launched the Commodity Murabahah Trading Platform (CMTP) in collaboration with the Dubai Multi Commodities Centre (DMCC). CMTP facilitates the online transfer and exchange of ownership and possession via tradable warrants. This platform also provides a solution to the Islamic finance industry and access to locally stored Shariah-compliant commodities for the execution of commodity Murabahah transactions and transfers of ownership and possession electronically. Besides DMCC, CMTP Dubai also joined with Emirates Islamic Financial Brokerage (EIFB) to offer the Nasdaq Dubai Murabahah Platform. In July 2023, e& acquired 63.3% of Beehive for $23.6 million. The business has enabled $650 million in SME funding. The company operates in the U.A.E., Saudi Arabia, and Oman. It has 18,500 active users as of December 2023.

Another worth noting is the P2P Islamic Fintech platform Easi Up, established in 2014 in France and founded by Anas Patel. This crowdfunding platform aims to assist community projects in promoting education, employment, capacity building, and training. As of March 2016, the platform has raised euros 355k for 26 campaigns.

Wahed Invest Inc. is a robo-advisory financial technology-based platform initially based in New York and founded in 2016. This platform aims to automatically analyze thousands of halal investment opportunities with the help of technology, creating a portfolio with a high potential for growth for its consumers around the globe. As per their website, Wahed Invest Inc. allows a minimum investment of US$ 7500. This platform adheres to Shariah law in all its activities, is monitored by an Ethical Review Board, and is registered with the Security and Exchange Commission. This platform has recently been engaged in the acquisition of Niyah to add banking services to its domain. This I-fintech business has active operations in the USA, Malaysia, UAE, and UK.

The Islamic fintech revolution renders significant benefits to IFIs and other providers and their customers by minimizing transaction costs and enhancing access to Islamic Financial services that are efficient, accessible from anywhere, and available at any time, thus improving customer convenience (Gomber et al., 2018; Kotarba, 2016; Kaplan & Mikes, 2016). Despite these advancements, research predominantly focuses on the technological and service quality dimensions from the provider's perspective, overlooking the consumer adoption process. Concerns about the slow adoption rate of fintech among bank customers have been raised, which impacts banking performance significantly (Hu et al., 2019; Meyliana et al., 2019). Furthermore, despite significant investments in Islamic fintech, consumers have a notable gap in utilization, indicating that the adoption of fintech is still in progress, and the reasons behind its slow adoption still need to be explored (Wenyu et al., 2019). This knowledge gap is critical as public sentiment can significantly influence the adoption and success of financial technologies. Public trust and positive attitudes are essential for Islamic FinTech to be widely adopted. The industry can improve adoption rates and user confidence by identifying and resolving negative sentiments or misconceptions.

Sentiment Analysis

Sentiment Analysis is the computational treatment of text data's sentiments, opinions, and subjectivity and is an evolving field in text mining. In other words, sentiment analysis is a method of opinion mining for analyzing large text volumes to determine whether the text exhibits a neutral, positive, or negative sentiment. The critical part of

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performing sentiment analysis is classifying the extracted data into sentiment polarities such as neutral, positive, and neutral (Qi & Shabrina, 2023). Literature suggests different ways to separate and classify sentiments (Yang et al., 2022). It typically analyzes textual data but can also analyze data in other formats like audio-visuals, body movements, and sounds. Literature refers to this type of sentiment analysis as multilabel sentiment analysis (Tao & Fang, 2020). In a nutshell, Sentiment analysis is one of the natural language processing (NLP) methods whose purpose is to determine the emotional sentiment of the analyzed text data (Ravi & Ravi, 2015).

Research Methodology

Research philosophy reflects a researcher's understanding of reality, truth, and knowledge (Creswell, 2003). It involves the researcher's beliefs and assumptions about the nature of the world (Saunders et al., 2019). These foundational beliefs and values inform the researcher's approach to strategizing, designing, formulating problems, and gathering and analyzing data (Saunders et al., 2019; Bryman & Bell, 2011). In academic inquiry, a researcher's worldview is often termed a 'Paradigm,' a concept first introduced by Kuhn (1970). Creswell (2017), however, defines a research paradigm as a conceptual framework that shapes how research questions should be approached to reflect reality accurately. This framework encompasses three key components: epistemology, ontology, and methodology (the approach to understanding). Outlining a research philosophy is crucial for unveiling the core principles underlying epistemology, ontology, and methodology, as suggested by (Nguyen et al. (2019; Jolita, 2018; and Holden & Lynch, 2004), and is vital for guiding the research process.

The first half of this research study focused on opinion mining of Islamic Fintech and followed the qualitative research method related to the postpositive worldview of philosophy. This study used secondary data from published articles on the Google Scholar search engine. In the Google Scholar search engine, we looked at relevant studies using keywords and Boolean operators such as "Islamic fintech AND sentiment analysis" and Sharia fintech AND Sentiment Analysis. The first search attempt with the keyword "Islamic Fintech AND sentiment analysis" generated 3,420 relevant results. Further results generated with the relevant keywords are given in the following table.

The second half of the study extracted user reviews of Haqq Wallet from the Google app store. This is a digital wallet for managing cryptocurrencies under Shariah principles. The wallet allows users to store, transfer, and receive digital assets. Google App Store is an excellent place to collect reviews. Users of Islamic fintech apps post their comments on the app store, which provides valuable insights. Initially, around ten thousand reviews were collected for sentiment analysis. The primary objective of this research is to classify customer reviews posted on Islamic Fintech applications using NLP techniques. The research has three main objectives: classifying user reviews based on sentiment polarity scores, making word clouds of customers' positive and negative reviews, and identifying common words in negative and positive word clouds. For this reason, the Haqq wallet is selected, which has the most significant number of reviews.

Data Collection

A fundamental purpose of this study is to review the recent literature on opinion mining of Islamic fintech to understand emerging themes in this area and reveal how opinions and sentiments of Islamic fintech differ across different geographical regions and digital platforms. For this reason, we analyzed published research papers to introduce fintech, its evolution, and its engagement with Islamic Banking and finance to familiarize the

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readers with the concept. We used the keywords mentioned in the following table to hunt for the research paper that was relevant to our research.

Table showing Keyword search and results

Keyword	Results generated	Final selection based on Inclusion criteria
Islamic Fintech AND Sentiment Analysis	3420	3
Shariah Fintech and Sentiment Analysis	466	1
Islamic Crowdfunding AND sentiment analysis	2,830	1
Islamic p2p loaning AND sentiment Analysis	8,040	1
Islamic Digital Banking AND sentiment analysis	28,000	1

Table showing inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Studies focusing on Islamic Fintech	Studies are not focusing on conventional fintech.
Studies that employ opinion mining	Studies are not focusing on opinion mining.
Published in peer-reviewed journals	Grey literature
Studies with full-text availability	Studies with full-text unavailability
Studies written in the English language	Studies published in other languages
Studies published after 2015	Studies published before 2015
Studies with empirical data and analysis	Studies that lacked detailed methodology and empirical data

The authors excluded all those research articles which deviated from the given research queries. Around 96 percent of the results rendered with the mentioned keywords gave variations, and most of the studies from those results appeared to be systematic literature reviews, bibliographic analyses, or sentiment analyses of fintech in general (Conventional Fintech), the evolution of fintech and Islamic fintech. The excluded papers were already used for the introduction, background, literature review, and other parts of this research paper. Following the main criterion, the researchers left with seven research papers focused on the subject under consideration. Those seven published articles are given in the following table.

Table showing final selected papers

(Haider, 2024)	Decoding Sentiments: Exploring Islamic Fintech Discourse on Twitter in the Post-Pandemic
(Hakim, 2024)	Islamic Crowdfunding: A Twitter sentiment analysis
(Razouk et al., 2023)	Analyzing public sentiment towards Islamic finance through social media: using sentiment analysis on Twitter data
(Isa & Suryomurti, 2023)	Sentiment analysis on the perception of sharia fintech in Indonesia
(Mu'adzah, 2022)	Sentiment Analysis on Sharia Credit Card using Senti-Strength

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(Salmah et al., 2022)	Sentiment Analysis on Islamic Capital Market during Covid-19 Pandemic
(Ocktavia et al., 2023)	Digital Zakat: An Analysis of Twitter Sentiment

For the second half of our research, we collected data from user reviews of Islamic Fintech service providers' apps on the Google Play Store. Google Play Store. We collected the reviews on two apps, Haqq Wallet and Islamic Coin. We used Google Play Scraper to collect and scrape these reviews. The beauty of this tool is that it seamlessly crawls the reviews from the Google App Store without any external dependencies. We made two distinct files of the reviews and then consolidated them into one master dataset for easy analysis.

Data Preparation and Analysis

The data in the CSV file was in the raw form. It contained various information such as the user ID, date of review, date of replies on the review, the thumb ups or thumb downs received on the reviews, ratings, and stars given by users to the apps, user comments, app version updates, etc., Among these pieces of information, the most crucial for our analysis was the user reviews and the ratings provided on the app by the users. However, the user reviews were in the raw form, and we needed to preprocess them for further analysis. This preprocessing tends to be the second step in the data sentiment analysis after scrapping or collecting the data (Hassani et al., 2020). While data preprocessing, we removed the punctuation, stop words, non-alphabetic characters, and extra spaces. During this step, we also converted the text of the reviews to lowercase to ensure consistent analysis.

After following the above steps, the data was ready for further analysis. We used Vader's Sentiments Intensity Analyzer (SIA) to label each review with values. SIA analyzed each review and gave its values based on each review's sentiment. For positive reviews, it was assigned 1; for negative reviews, it was assigned -1; and for neutral reviews, it was assigned 0.

To validity, we manually reviewed a random sample of 20% of the dataset to ensure the accuracy of the automated labeling. This step ensured a high harmony of 94% between the manual and automated sentiment classifications.

Data Visualization

To visualize the output of the above steps, we used Python dependencies such as Pandas, Seaborn, and Matplotlib. We visualized the results with a Pie chart for sentiment classification, word clouds for visualizing common words and terms in combined, positive, and negative reviews, which helped us identify the common topics and issues within the reviews, and a bar chart to show the number of ratings or starts provided by the users.

Discussion and Interpretations

After reviewing the selected papers for analysis, the following information was collected. All the papers listed under the following table only classified sentiments but did not identify common words or themes after sentiment classification. The analysis results reveal that most researchers found neutral sentiments in the most significant percentage, except for the study of (Octavia et al., 2023). The following table summarizes the findings of the analysis.

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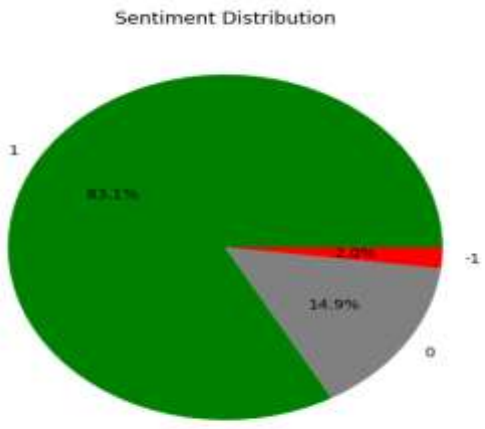
Table summarizing papers on Sentiment analysis of Islamic Fintech

Authors	Data Source	Sentiments Classification
(Haidar, 2024)	X (Twitter) Social Media Platform	Neutral = 55.6% Positive = 33.3% Negative = 11.1%
(Hakim, 2024)	X (Twitter) Social Media Platform	Neutral = 47.2% Positive = 44% Negative = 8.7%
(Razouk et al., 2023)	Questionnaires, 71 Published Papers	Neutral = 76% Positive = 16% Negative = 8%
(Isa & Suryomurti, 2023)	X (Twitter) Social Media Platform	Neutral = 80% Positive = 16.2% Negative = 3%
(Mu'adzah, 2022)	Research Papers from Dimension metadata	Neutral = 41.16% Positive = 34.30% Negative = 16.6%
(Salmah et al., 2022)	Research Papers from Dimension metadata	Neutral = 48% Positive = 30% Negative = 21%
(Ocktavia et al., 2023)	X (Twitter) Social Media Platform	Neutral = 28.6% Positive = 51.7% Negative = 19.7%

After looking at the table, it becomes evident that most of these researchers came up with neutral statements about Islamic Fintech as the most significant, followed by positive sentiments as a second in the list, while a tiny percentage of users reflected negative sentiments.

Most of these researchers collected data from the X platform, while some also analyzed secondary data through published articles on the topic. X platform is a good source for sentiment analysis. However, the content and data collected from the X platform do not always render actual meaning and can be manipulated. For this reason, we went further to collect the actual data regarding Islamic fintech from the Google app store on an Islamic fintech service provider app called Haqq Wallet. The following are the details of our data analysis.

We began our analysis to unveil Islamic Fintech users' sentiment distribution or polarity. 10470 reviews were considered for analysis across two Islamic Fintech apps: Haqq Wallet and Islamic Coin. As depicted in the following pie chart, the sentiment distribution was as follows: 83.1 % of reviews were positive, 2.0 % of reviews were negative, and the remaining 14.1% of reviews happened to be neutral.



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Interestingly, most of our analyses were inconsistent with other studies focused on Islamic Fintech sentiment analysis, especially those analyzed for this research (Haidar, 2024; Hakim, 2024); (Mu'adzah, 2022; Razouk et al., 2023; Salmah et al., 2022). As mentioned earlier, those studies identified the neutral sentiments as the most significant, while our analysis shows that the positive number of reviews is the most significant. However, our results perfectly harmonize with Isa & Suryomurti (2023).

Word Clouds

Word Cloud is a data visualization graph that can show the key most important words that appear in a corpus of text data. The word cloud below shows the frequently used words in the data. In the data CSV file, there were 10470 reviews. We uploaded the file into Python using Windows PowerShell. There was a total of 10470 words in the reviews. After visualizing the text, we noticed that in the total words used in the reviews, the following words were mainly used: good, excellent, app, wallet great, love, easy, etc., as shown in the following word cloud.

Combined word cloud

The combined word cloud ensures the numerousness of the positive words. This prevalence of positive reviews, 83.1% of the total reviews, indicates that users have satisfactory experiences with Islamic fintech apps, particularly concerning elements such as shariah compliance (Halal), ease of use, and aligning financial practices with Islamic principles. This finding is consistent with previous research stressing the growing acceptance of Islamic fintech services among Muslim populations (Abdullah & Rahim, 2022). However, only 2% of negative reviews signify that some sections of user experience, such as customer service and app stability, may require attention and improvement.

To make separate word clouds for positive and negative sentiment displays, we created two data frames out of the one with positive, negative, and neutral reviews. In one of the two data frames, we kept all the positive reviews, and the other had all the negative ones. This process aimed to achieve the second objective of this study, which was to identify users' negative and positive sentiments and explore what they say when they have negative feelings and what they talk about when they have positive emotions. The combined data frame contained around 10470 reviews, of which 8702 were positive and 1,571 were negative. After visualizing this, we got the following results.

Positive word cloud

The positive word cloud gave us the following results. Out of the total words present in the reviews, 8702 were positive. Among these positive words, the most frequently are good, easy, nice, great, Islamic, etc., as depicted in the following word cloud.

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Positive word cloud

Most of the positive reviews pointed towards satisfaction with the ease of use, compliance with Islamic principles, and efficient transaction processes. Common themes among positive reviews included the user-friendly interface, convenient financial services, and innovative features. For example, a user reflected, *"I am Muslim. That's why I love and download Haqq wallet; anything established in Islamic or Sharia way I support it may Allah grant Haqq and Islamic coin."* This feedback aligns with the growing demand for fintech services that cater specifically to Islamic finance, as users admire the integration or embodiment of Islamic principles into financial technology.

The positive sentiments highlighted other features such as security and privacy, critical for any fintech platform. Trust in these services will likely contribute to their continued adoption and growth. The analysis revealed that terms like "secure," "convenient," and "halal" frequently appeared in positive reviews, as illustrated by the positive word cloud.

Negative word cloud

This classification aims to determine which were most frequently used in negative sentiments. In other words, this can show us what makes the user think negatively about the app or the services provided by the app. Here, we can see that the word cloud depicts words like Scam, fake, useless, etc., exhibiting why users think negatively about the app.

Negative word cloud

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On the other hand, negative reviews were primarily driven by Islamic Fintech providers' app instability, transaction errors, user support issues, and issues related to scams and fakeness. A few customers voiced frustration with the fakeness of the app. For example, a user expressed, *" They scammed me. First, they said I had to deposit in ETH, and I did 104 ETH. Then they asked me to pay 70 USD, but I deposited ETH again, equivalent to 70 USD. Then they refused to count ETH and told me to deposit 70 USD again, which I did, and then they asked me to deposit a merging fee of 60 USD. I have asked them to return all my money, and I'll make another account, but they aren't replying. They should feel ashamed calling themselves an app for Muslims while scamming others."* Such complaints suggest that Islamic fintech apps offer desirable services, but their technical infrastructure may require further development to meet user expectations.

Neutral Sentiment

Our analysis shows that 14.1% of the users had neutral sentiments about the service provided by Islamic fintech providers. Users described their opinions in these sentiments, involving generic, balanced, or undecided feedback. For example, a user reflected, "It looks good, but it needs to improve". These sentiments caught a more balanced perspective, which neither mirrored satisfaction nor dissatisfaction nor included both in a single feedback.

Connection to Literature

The study's results are consistent with the extant literature on adopting Islamic financial technology, which proposes that satisfaction and ease of use are influenced by the perceived compatibility of financial services with religious beliefs (Khan et al., 2021). The dominance of positive reviews in the combined word cloud and subsequent results of the positive word cloud consisting of more than 8,000 out of 10470 words highlight the need to provide technologically advanced financial services that adhere to Islamic business principles. It indicates a growing demand for consumers who want their financial matters to be digitalized under Islamic business and financial principles. Other research has also found that trust, shariah compliance (Halal), satisfaction, and ease of use are the main drivers of adopting financial technology. This research also found abundant themes in the combined word cloud, consistent with other researchers validating their findings.

Conversely, the negative word cloud boasts words like scam, fakeness, error, slow, etc.; these words indicate where Islamic Fintech providers need to improve their apps to ensure seamless tech-enabled Shariah-compliant financial services.

Discussion of Results

This research signifies that the main drivers of Islamic financial technology adoption are religiosity, ease of use, satisfaction, transaction speed, and security. While the drivers that prevented users from adopting fintech were scams, fakeness, slow transactions, etc., These findings show that Islamic fintech apps are generally well-received. However, there are significant areas for improvement, particularly regarding technical performance, customer service, and awareness. The information found by this analysis provides actionable suggestions for providers of Islamic fintech services. For example, addressing technical issues such as transaction delays and app crashes should be a priority to reduce user dissatisfaction and negative reviews.

The analysis reveals that security, compliance, and ease of use are the foundations of positive user experiences, suggesting that future innovations in Islamic fintech should

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further enhance these features. At the same time, improving customer support and ensuring that apps run smoothly, without technical interruptions, will likely reduce the number of negative reviews and improve overall user satisfaction.

The findings also contribute to the growing literature on Islamic fintech by providing empirical evidence of user experiences and perceptions. This study confirms that while ethical considerations are paramount in adopting Islamic fintech, users also expect the same level of service quality that they receive from mainstream fintech services.

This study used sentiment and thematic analysis to examine user sentiment towards Islamic fintech applications, specifically focusing on the Haqq Wallet and other similar platforms. By analyzing a large dataset of user reviews from the Google Play Store, this research sheds light on how users perceive the functionalities, ethical adherence, and overall performance of Islamic fintech apps.

The findings demonstrate that positive sentiment dominates user feedback, with many users expressing satisfaction with these apps' ease of use, Shariah compliance, and security. These features align with Islamic finance's core values, emphasizing ethical practices and compliance with religious principles. The high level of trust in these applications underscores their growing acceptance and potential for further market penetration, especially among users seeking financial solutions that align with Islamic values.

Conclusion

This study analyzes 10740 users' reviews of two Islamic Fintech Apps on the Google Play Store. The study aimed to unveil users' sentiments about Islamic fintech providers and categorize them as positive, negative, and neutral. This categorization was based on the method of using the NLP approach, as discussed in the methodology section of the study. The study concludes that Islamic Fintech has witnessed increased growth and acceptance among users globally. Malaysia, Indonesia, Saudi Arabia, and UAE have established specialized hubs for Islamic Fintech and are paving the way for Islamic Fintech development.

The evidence demonstrates the predominance of positive sentiments among users of Islamic Fintech Services to exhibit that people are satisfied with their services. The positive sentiments are evident from the most common words used in all the 10470 comments collected for analysis from the Google Play Store. These words are compliance, shariah, ease of use, seamless. Furthermore, the study shows that 83.1% of the total comments are positive, only 2% are negative and 14.1% are neutral.

We conclude that the positive reviews posted by users of Islamic fintech services appreciated Islamic fintech's ability to provide shariah-compliant financial services, the frequent appearance of the words, such as easy, good, and great among positive comments and the subsequent word cloud further support his conclusion. Other scholars who have studied Islamic fintech adoption also confirm that Shariah compliance attracts users to accept Islamic Fintech, further strengthening our conclusion.

On the other hand, 14.1 percent of negative sentiments were dominated by words like “scam" and “useless”. The existence of these words in the negative word points to the attention of Islamic fintech providers to improve the reliability and stability of their platforms. We conclude that these issues were related mainly to the lag in customer support and communication gaps with customer care. With our analysis, we can deduce that Islamic Fintech has laid a firm foundation and has attracted an increased user base. However, the issues, particularly the communication gap, should be improved through

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enhanced technical infrastructure and by adopting a proactive approach towards customer support.

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