

Fintech: Exploring the Digital Transformation of Banking & Financial Services

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Abstract. Fintech has exploded since the Internet revolution. Today, fintech has given rise to numerous segments, and many financial technologies have gained wider application. Among which the most active fintech areas are: online payments via digital currency without the need for cash; P2P lending, which enables direct person-to-person lending without the use of intermediaries; robo-advice, which use algorithms to provide investment advice; and distributed ledger technology (DLT) blockchain. They are all widely used in some countries around the world, but have not yet undergone a complete replacement. These emerging financial technologies have undoubtedly revolutionary implications for traditional finance, providing new ideas for the development of the financial sector. The problems they generate deserve attention as well. This paper introduces the development history of these four financial technologies, compares them with the traditional way of operation in the financial field in which they applied, and analyzes the advantages and limitations of these financial technologies. Finally, reflections on the future of fintech development are presented.

Keywords: Fintech; online payment; P2P lending; robo-advice; blockchain.

1. Introduction

Fintech is an industry that has been developing since the late 19th century and aims to use various technologies for financial purposes. Fintech is now frequently seen as a distinctive integration of financial services and information technology. In fact, there is a long history of interaction between technology and financial instruments. Technology and financial progress have always been entwined and mutually supportive. Fintech's beginnings may be found in the Financial Services Technology Alliance, an initiative started by Citigroup to encourage technological cooperation, in the early 1990s [1]. The global financial crisis of 2008 marked a turning point in the growth of fintech and played a role in its transformation [1]. The financial crisis worsened public impressions of and trust in banks by generating a discussion over who was legally entitled to hold and offer financial resources. During the financial crisis, open banking and fintech enabled for new providers to enter the market and the availability of financial data by third parties [1]. The prospect for technical innovation presented by this new transformation increases the difficulty for market participants and policymakers in balancing possible dangers and rewards of innovation.

Fintech underwent yet another revolution in 2019 as a result of the financial difficulties caused by the global pandemic. The necessity for digitalization has grown as a result of the COVID-19 outbreak. The need for systems like online payments, credit, insurance, and digital wallets rapidly rises during the COVID-19 epidemic. Several fintech firms have been founded as a result of the fintech industry's rapid development trend. The most recent advancements in information technology and its convergence have allowed financial organizations to not only automate existing business operations but also to provide the financial services sector with new products, services, procedures, and business models [2]. Today, fintech has given rise to numerous segments, and many financial technologies have gained wider application. Online payments have replaced traditional cash payments. Instead of having to resort to banks, lending and borrowing can be done on a person-to-person basis. Investors can invest without the advice of a human advisor and instead utilize robo-investment advisors. The ever-evolving blockchain technology as well as Bitcoin. These emerging technologies have revolutionary implications for the financial sector.

This paper describes the development of online payments, P2P lending, robo-advice, and blockchain, contrasts them with the traditional ways of operating in the financial sector, and analyzes

the advantages and limitations of these financial technologies. Finally, a conclusion is made and reflections on the future of fintech development are presented.

2. Online Payment

When the Federal Reserve Bank of the United States used the telegraph to send money to the country for the first time in 1918, the history of electronic payments began [3]. However until the Automated Clearing House (ACH) was formed in 1972, the technology was not widely applied in the United States [3]. After that, electronic currency became widely used. This gave American commercial banks and their central treasuries a substitute for check payments. Electronic payments have replaced paper-based payments in the credit card business. Large businesses like department shops and oil companies started giving their customers credit cards in 1914 so they could use them to pay for products and services [3]. By the 1990s, credit cards completed the transition from paper to electronic payments, and today, credit and debit cards have become one of the most common forms of payment for transactions, capable of being used to pay for almost any type of purchase.

With the development of e-commerce, cashless payments became widely used in the 1960s. With the creation of mobile banking and mobile wallets, online payments reached a higher stage and electronic cash payments became more closely linked to credit and debit card payments, with many companies offering online payment platforms that allow users to pay them via electronic cash. P2P transfers have also gained full momentum due to the popularity of payment platforms such as Apple Pay, PayPal and others. Today, P2P transfers, bill payments, mobile top-ups, etc. can all be conveniently implemented through online payments.

Security is the most crucial problem for any payment method. Counterfeit currency is a major issue for traditional cash payments, especially as counterfeit currency forging technology becomes more and more advanced, making it difficult for the recipient to immediately recognize the authenticity of the cash, and even the money detector may make mistakes. Even if counterfeit money is found, it is difficult to trace back to the specific payer and recover the cash. The second security issue is the storage of cash. Cash is vulnerable to the risk of theft and loss, and it is difficult to keep large amounts of cash in a reasonable manner. In both respects, online payments do a good job of avoiding these two problems. Digital money is impossible to counterfeit or steal, dramatically enhancing security and making safekeeping easier.

However, online payments also create some new security issues. The most serious problem is that transaction records can be monitored by the payment platform or the recipient to obtain information such as the password of the user's bank card. In response, all major payment platforms have their own encryption technologies to avoid these security problems. For example, apple protects the picture displayed of the user's credit card to ensure that companies cannot get the card number [4]. Meanwhile, if a user loses their phone, they can simply turn on the "Find My iPhone" feature to stop payments. In addition, Apple announced that it does not collect payment information from each transaction, protecting the user's privacy. PayPal takes data encryption for security. When a user logs into PayPal, the application verifies that the user's browser is running SSL, a data encryption technology, and during transmission, PayPal uses SSL-protected 168-bit key length encryption to protect the information [4].

From its initial development, online payment has reaped more and more user groups and gradually become an alternative to traditional payment because it has a better user experience compared with traditional payment methods. Online payment gets rid of the limitation of payment time and place. Since mobile payment can be transacted on the Internet, through the Internet, users can make payments and check their accounts anytime and anywhere, which makes online transactions easier compared to traditional transactions. Online payments are more cumbersome to set up for the first time, which is one thing that makes it a lagging experience behind traditional payments. There are specific processes to go through from applying for a credit card to tying it to a payment platform

account, which adds limitations to the user base for online payments. But with the online payment method open, users are able to make payments more easily, which provides a better user experience.

Compared to the traditional process involving the payee and the payer, the online payment process involves the medium of the payment platform. Therefore, the risk of data leakage from malware is one of the main threats to online payments. Users' account numbers and other information may be stolen by malicious Trojans. After installation, Trojans collect hardware and software information from the server side and inform the console users through E-mail and other means [5]. The Trojan listens to the user's operation on the terminal and sends the exposed user account number and password to the stealer, who uses the stolen account number and password to obtain the account funds [5].

3. P2P Lending

In 2005, the Zopa platform was publicly launched in the UK, which was the first P2P platform in the world and the origin of P2P lending [6]. Since then, P2P has gradually become known to the public, with the financial crisis being a turning point. In the decade following the 2008 financial crisis, hit by stock market and macroeconomic turmoil, interest rates on U.S. Treasury bonds fell rapidly, and as a result, investors needed higher-return investment channels and borrowers needed better sources of borrowing. To meet the growing demand for alternative finance, P2P lending grew rapidly, and on the supply side of credit, new lenders entered the market, attracted by the higher interest rates offered by P2P assets relative to traditional bank products. In addition, on the demand side of credit, a broader and more creditworthy pool of potential borrowers has emerged as banks deleverage.

For lenders, P2P platforms do not have intermediaries to cushion certain risks and will allow investors to take higher risks themselves and, at the same time, reap higher rewards. In a person-to-person scenario, investors need to independently select different P2P platforms and loans offering different risk categories and maturities, and these choices have an impact on the returns received by investors. As a result, risk diversification is essential to increasing the returns of P2P loans, therefore it is crucial to place comparatively small wagers on a number of different loans [7]. Most systems include additional information for lenders' convenience, and investors may determine their maximum investment and its allocation depending on the risk level and loan maturity. The risk of interest rate fluctuations and credit are larger the longer the term. As there is no secondary market, P2P loans are not significantly impacted by market interest rates. However, P2P loans are subject to interest rate risk and if lenders invest in long-term loans, they will miss out on the opportunity to earn higher returns if interest rates rise. However, statistics such as returns provided by the platforms are not enough for investors to make the best investment decisions, which makes it necessary for investors to make more research.

Another issue with peer-to-peer lending is the absence of legally binding disclosure regulations to guarantee that lenders are fully aware of the risks involved in utilizing a specific P2P platform. As a result, lenders are left to take on the danger of a platform's insolvency or shutdown. Because the platforms' credit assessment methods differ significantly from those of banks and because there are no disclosure standards for borrowers' credit assessment methods, some borrowers rejected by banks end up being accepted by P2P platforms. This means that P2P platforms are facilitating access to borrowers with high credit risk, such as SMEs and startups. And it is the lenders, not the platform, who will bear these risks.

The main advantage of P2P lending for P2P borrowers is the simplicity of using the internet platform. As compared to bank loans, the benefits are mostly seen in the lower transaction costs throughout the loan application process and the significantly shorter period between the initial point of contact and the receipt of loan payments [7]. The platform is available around-the-clock, every day of the week, and the application procedure is straightforward and open. And P2P offers additional flexibility than banks, with most platform forms allowing borrowers to cancel their loan contracts early without having to pay an advance payment default [7]. The biggest drawback for borrowers is

the lack of assurance over whether the lender will approve their loan and their ability to borrow the entire amount asked. If the lender rejects to lend, the borrower is compelled to increase the interest rate until a lender agrees to lend to them.

P2P lending needs to be reasonably regulated in order to take advantage of its advantages, and for regulatory measures, countries that already have more sophisticated P2P lending provide a good example. A well-established personal credit system facilitates regulation. Most British residents' credit reports are available from the three major credit scoring companies in the country. The UK Information Commissioner's Office directly regulates the UK credit scoring agencies, who must adhere to all applicable legislation [8]. P2P investors in the U.S. choose their investments based on their FICO credit scores, with higher FICO scores resulting in lower risk and lower returns, and no guarantees for investment activity [8]. The flow of funds is transparent, and the projects are real and reliable, which can be measured by a uniform credit score. In 2008, P2P platforms in the US accepted the requirement of the Securities and Exchange Commission (SEC) to register their issuance as securities, and investors can learn about their real operation status through the announcements released by the platforms on a regular basis [8]. P2P lending was first regulated by the Financial Conduct Authority (FCA) in 2013, and the FCA must provide permission for P2P lenders to operate. In March 2014, the P2P lending business was subject to the first regulation ever. The "Rules for the Regulation of Internet Crowdfunding and the Issue of Securities by Other Means Not Easily Realized," which explicitly set the regulatory criteria for P2P lending, was presented in March 2014 as the first regulation of the P2P lending business in history [8].

4. Robo-Advice

With the aid of big data, cloud computing, and artificial intelligence, robo-advisors automate investment and financial management by offering investment consulting services and recommending investment portfolios based on users' investable funds, risk tolerance, expected returns, expected investment goals, income, and other information. Robo-advice originated in the U.S. In 2010, the first new intelligent investment advice product was launched in the U.S. to automate traditional investment advisory services through intelligent algorithm technology and put them on the market to provide investment and financial services, and quickly became the first choice of securities companies with its advantages of no threshold and low cost [9]. The largest wealth management company in the world, BlackRock, bought the robo-advisory company Future Advisor in 2015 [10]. These different robo-advisors are not only able to provide portfolio management services, but also to provide investment advice. investment advisors are able to provide not only portfolio management services, but also tax management and investment decision making services, which has led to their widespread adoption around the world.

As a newcomer in the financial investment world, robo-advisors have shown many advantages of their own over the years of application. Robo-advisors can be accessed at any time and place without going through complicated processes such as organizing meetings, and they can keep track of returns through it, which makes robo-advisors highly convenient. The price of financial advice can be decreased using robo-advisors. Robo-advisors can cut fixed expenses in comparison to human advice companies, which allows them to lower the minimum investment requirements. A completely automated robo-advisor, for instance, bills a fee of 0.25% of assets under management, whereas typical human advisers bill a minimum of 0.75% [10]. The behavioral biases that are frequently present in financial advice can also be lessened with the use of robo-advisors. Human advisers have limited capacity to simultaneously monitor several assets and are vulnerable to bias, favoring the goods for which they get fees. Artificial intelligence can provide more accurate risk-return estimations and resolve portfolio optimization issues with complicated limitations. Investors will therefore receive more unbiased investing advice by switching the decision-making process from people to robo-advisors.

Since the robo-advice process is automated, robo-advisors are unable to generate face-to-face contact and communication with investors, and thus may lead to consumer disengagement. Robots do not know the rest of the investor's investment profile and investment preferences, and investment recommendations made solely based on big data and cloud computing may not be the best fit for the investor. Robo-advisors may violate regulatory restrictions. Because robo-advisors are programmed to serve their clients' specific objectives rather than consider their broader interests, they cannot be fully considered fiduciaries and therefore they cannot fully assume fiduciary responsibility for their investors [11]. In robo-advice, the algorithms of smart investment advisors are not fully disclosed to investors, making it difficult for them to provide investors with clear explanations as to why certain recommendations are given. This can undermine trust in financial services, spread bias, or harm certain groups of clients. The complexity of algorithms becomes particularly problematic in times of economic downturn. The opaqueness of artificial intelligence learning methods can be a source of macro-level risk that may have unintended consequences.

In order for clients to understand their investment behavior and potential conflicts of interest and for investors to be able to rationally adopt their decisions and make sensible investment behaviors, robo-advice should continue to be as open and transparent as possible about the costs, potential risks, and algorithmic limitations of their services.

5. Blockchain

Blockchain is a distributed digital ledger that is decentralized and records transactions across several computers but without ability to go back and edit information. Because to its unique characteristics, blockchain has a unique influence on financial services and transactions in the financial industry. Whenever a financial transaction is added to a blockchain, a third party is no longer required to validate it; instead, the network can use consensus algorithms to autonomously verify the transaction [12]. Blockchain reduces transaction processing time and settles cross-border transfers more quickly than conventional methods by doing away with the intermediate verification step. The blockchain uses asymmetric key encryption methods and hash functions to guarantee the security of transactions [12]. Blockchain makes sure that all blocks are connected and that each block contains both its own hash and the hash of the preceding block, making it impossible to modify and allowing the network to detect any modifications to guarantee that all data is preserved [12]. Transparency between nodes in the blockchain network is made possible by the fact that all transactions in the blockchain are recorded and disseminated, allowing for their verification and tracking. In addition to recording financial transactions, blockchain also supports the use of bitcoin for transactions in peer-to-peer networks. Examples of active bitcoins are Bitbond, BitnPlay, BTCJam, Codius, etc. [13].

Despite the blockchain technology's enormous potential, there are several fundamental obstacles preventing its wider implementation. Due to this, blockchain technology has so far not been widely used. Scalability in this sense refers to the capacity of the blockchain's computing processes to handle heavy workloads and complete these tasks in a fair amount of time. In other words, the output should be properly processed by the blockchain with the least amount of delay possible. Blockchain technology is less able to process data since it requires a lot of computing. Financial organizations need to handle thousands of transactions per second, however Ether can only process around 20 transactions per second while Bitcoin can only process about 7 transactions per second [14]. Making blockchain technology capable of processing more transactions is not difficult as the field develops. Another challenge is that security and scalability frequently go hand in hand. Blockchain must thus make significant advancements if it is to be adopted widely and be able to fulfill the operational, security, and resilience concerns of financial institutions.

Decentralization is a key tenet of blockchain technology, and since it is distributed and decentralized, blockchain programmers and developers are free to adapt the system to match the demands of particular users [14]. Yet the absence of standardization also makes it difficult for blockchain users to cooperate and communicate efficiently. As there are several blockchains that each

offer a different set of benefits, there is no need for an unified technical format that can be used for all applications when it comes to blockchain technology. By limiting the options, it would be easier for various systems to communicate information without having to invest in the time, cost, and technical know-how needed to create unique interfaces.

The fact that transactions on a blockchain can be anonymous yet still not be safe or private makes the blockchain less private. Yet, even if the data is kept in a hashed manner in an effort to safeguard it, certain metadata is still accessible to network participants even with correct blockchain design. The activity of any public address on the blockchain network may be exposed by keeping an eye on this metadata, and if it is kept an eye on for a long enough amount of time, the identity of the persons involved in the transaction can even be determined [14]. With the development of quantum computing, today's relatively secure cryptographic algorithms may become vulnerable. Therefore, the security and confidentiality of blockchains need further improvement.

6. Conclusion

Since their emergence, financial technologies have had a very significant impact on countries and economies around the world. On the one hand, they have improved the quality of services provided by financial institutions and the ease of use of any financial service by customers, and they have extraordinary prospects for their application in the market due to their increased automation and, to some extent, lower costs for both parties to the transaction. On the other hand, due of the low quality of the services it may offer and the absence of legal control, which can quickly result in harm to the interests of clients or institutions, it also constitutes a threat to the financial system.

Each new technology has to undergo many innovations and improvements in the process from its creation to maturity. Since financial technologies are directly related to the interests of the parties involved in the transaction, investors and consumers have to make careful choices in using these technologies and determine the risks and uncertainties they need to bear before using them, while the relevant laws and information technology sectors continue to improve. It is undeniable that no financial technology is currently fully prepared to completely replace the old traditional solutions. But this also provides new opportunities for the market to develop and presents financial firms with the challenge and opportunity to master new financial technologies. But fintech will undoubtedly see continued rapid growth in the future, and it may completely disrupt the financial sector and bring new business models to the financial industry.

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