



**UNDERSTANDING DIGITAL FINANCE: A CONCEPTUAL ANALYSIS**

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**Abstract**

*This paper is a conceptual review and analysis of digital finance. Although, different authors define digital finance (DF) differently, some common factors run through the different definitions reviewed. The review, therefore, reveals that DF broadly encompasses digital products and services, digital technologies, digital infrastructures/architectures, digital agents/providers, digital platforms, digital business operations and processes as well as human interface involved in the provision of financial products and services to different customers. It was also found out that proxies used for DF in studies reviewed include mobile banking, internet banking, electronic banking, branchless banking, mobile money, debit cards, credit cards, Point of Sale (POS), mobile wallets, agency banking. It is evident through the literature also that digital disruption and revolution have come to stay and is taking place in the financial services sector at a speed of light and this speed will intensify further in the near future. Thus, DF, being a relatively novel subject matter in finance, needs more intensive and extensive studies, in order to give it the deserved popularisation to reap the benefits it promises to deliver.*

**Keywords:** Digitalisation, Digital Economy, Digital Finance, Digital Revolution, Digital Technologies

**1. Introduction**

We are in the age of digitisation, and finance as a discipline has been affected by this digital revolution. As a dynamic field of study, finance borrows from many other disciplines like economics, psychology, computer science, operations research, etc. Traditionally, finance borrows heavily from economics. In fact till 1890, finance was still a branch of economics (Olowe, 2009). Thereafter, other fields have lent their inputs into finance. Another discipline that contributes significantly in the recent times to the development of finance is the information and communication technology (ICT). ICT's influence on finance is overwhelming. This has brought about the digitalisation of the entire financial system, otherwise called digital finance (DF).

DF is an essential aspect of the field of finance whose impact on the economy of any country cannot be undermined both at present and in the future. For instance, DF was projected to boost the gross domestic product (GDP) of developing economies by \$3.7 trillion by 2025.



Specifically, lower-income countries like Nigeria, Ethiopia, and India stand to enjoy a higher benefits of DF, by contributing between 10 to 12 percent to their GDP (Manyika, Lund, Singer, White & Berry, 2016). Similarly, the remarkable progress made by the Nigerian financial sector in the last three decades, has been facilitated by digital revolution occasioned by advances in ICT and, computer and mobile technologies (Amangbo, 2019). These potentials, notwithstanding, to harness the goldmine in DF, Manyika, *et al.* (2016) argue that there is a need for a robust digital infrastructure and robust financial markets capable of providing varieties of financial products and services to people.

However, DF as a subject matter has not attained a desired level of popularisation among some of its stakeholders, most especially the teeming consumers of the service. For instance, the meaning of DF varies across users and definers; hence, DF is still lacking a widely acceptable definition (McKee, Kaffenberger, & Zimmerman, 2015; Sajoh & Bello, 2019; Shofawati, 2019; United Nations Environment Inquiry [UNEI], 2018). How will the large populace of consumers of digital financial products be properly served if they cannot clearly understand what DF entails? Hence, there is need for a conceptual review on DF. It is against this backdrop that this paper, carried out a conceptual analysis of DF, and reviewed some current and emerging technologies affecting the financial services industry. The review was aimed at facilitating proper understanding of the subject matter of DF-its meaning, concept, and its operational measures in empirical studies.

The other parts of this paper is organised thus. Section 2 reviews the various definitions of DF. Section 3 presents the different terminologies associated with DF while section 4 reviews the measures/nomenclatures of DF. Section 5 introduces some current and emerging technologies influencing financial services and finally, section 6 concludes the paper.

## **2. Literature Review**

### *Definitions of Digital Finance*

Attempts have been made by different scholars to define digital finance (DF). Some of the definitions are reviewed and analysed here. For instance, DF has been described as a suite of financial services rendered via digital devices and platforms such as the internet, personal computers (PCs), mobile phones, and cards, connected to an efficient digital system of payment. (Consultative Group to Assist the Poor [CGAP], 2015; Durai& Stella, 2019). This definition basically emphasises two basic dimensions of DF, the product dimension, and digital platform dimension. In addition, DF as defined by Shofawati (2019), means the totality of technologies, infrastructures, products and services, which facilitate easy access to financial services via the internet by individuals and companies, without necessarily visiting the bank or having physical contact with the financial service provider (FSPs). Shofawati (2019)'s definition goes beyond the description of DF as a mere product, but encompasses technology and infrastructure.

In the same vein, McKee, *et al.* (2015) observed that digital financial services (DFS) include the various digital financial products and services, digital channels as well as providers of financial services. This implies that DF includes products, channels as well as providers (agents) of digital finance. Furthermore, Alliance for Financial Inclusion Global Policy Forum [AFI], (2016) and Kambale (n.d.) also describe DFS as all forms of financial products and services accessed and delivered through digital channels. According to the authors, examples of financial



products are credit, remittances, payments savings, insurance, etc. They also itemize digital channels to include internet, mobile phones, POS, biometric devices, (Automated Teller Machines) ATMs, tablets, phablets, etc.

Furthermore, Asian Development Bank [ADB], (2016) submits that DF is a wide range of technologies which enable the provision of financial services by FSPs to their wide range of customers. To ADB (2016), DF basically connotes technology. Holtmann (2016) simply refers to DFS as the process of rendering financial services utilising technology. Holtmann (2016)'s definition though short, but it encompasses the trio of the process, product as well technology dimensions of DF.

In the same vein, DF is also described as the process of providing customers directly with transactional products and services using interactive and electronic communication channels (Harelimana, 2017). This implies that DF is a process by which digital products are delivered to customers through digital channels. DF can also be defined as a set of financial products and services provided through digital infrastructures and platforms with minimum use of cash and with less need for direct involvement of traditional bank branches (Dara, 2018; Manyika, *et al.*, 2016).

A more comprehensive definition of DF, was given as a crop of various new financial products, financial businesses, finance-related software, and new forms of digitally-driven customer communications provided by FSPs and fintech companies (Gomber, Koch & Siering, 2017; UNEI, 2018). In addition, Gomber *et al* (2017) refers to DF generally as the digitalisation of the financial industry. To make use of DFS, Ozili (2018) states that users need three things, namely, a functional bank account, available funds or overdraft in their banks accounts and digital platforms (such as PCs, or mobile phones).

Furthermore, according to Organisation for Economic Co-operation and Development [OECD] (2017) (as cited in OECD, 2018), DFS refers to all range of financial operations and services carried out by financial institutions, using digital technology such as mobile financial services (MFS), e-money, and branchless banking. In other words, DFS entails the provision of financial services as well as performance of financial transactions through digital channels (Grossman & Nelson, 2014). Grossman and Nelson in their definition consider the platform/channel dimension as well the product dimension of DF.

From these definitions, it is clear that DF involves digital financial products, digital financial business operations and process, digital technologies, as well human interface that ensure a successful process of meeting the requirements and needs of customers of financial products services.

DFS are rendered with certain motives in mind. Kambale (n.d.) posits that some of the reasons for the provision of DFS are to reach larger audience of unreached customers; to increase financial inclusion; to increase efficiency of delivery of service; to improve quality of service; and for revenue growth, and offering of new products and services enabled by technology; and to reduce cost to both companies and customers. Furthermore, DFS aim to capture new market segments; to improve and differentiate; to create new business models to reach mass market clients; to reduce churn and, to cross-sell new payment services (ADB, 2016; Holtmann, 2016).



### *Concepts in Digital Finance*

There are some terminologies/concepts associated with digital finance. These concepts are reviewed below.

*Digitalisation/Digitisation:* Digitisation is the process by which sets of analog information are changed into digital bits of 1s and 0s with discrete and discontinuous values (Brennen & Kreiss, 2014). The authors opine that the process of digitisation has both symbolic and material dimensions. Symbolically, digitisation converts analog signals into bits of 1s and 0s. Materially, digitisation produces information that is expressible in numerous ways, on various sorts of materials, and in numerous systems. Digitalisation, on the other hands, involves the structuring of major segments of social lives of people around digital communication and media infrastructures (Brennen & Kreiss, 2014).

*Digital Economy:* Digital economy simply refers to the massive employment of information technology (I.T.) infrastructures in all segments of the economy. In a digital economy, internal operations of business, government and non-profit organisations, as well as transactions among them are executed using I.T. infrastructures. Such economy is based on three technological trends, which according to Atkinson and McKay (2007), are the commoditisation of computing capacity and data storage, digital network and software platforms (the internet). Furthermore, the three main components of digital economy identified by United Nations (2019) are the core aspects (fundamental innovations, core technologies and enabling infrastructures), digital and I.T. sectors, and a wider set of digitalising sectors.

*Digital Financial Inclusion:* Digital financial inclusion (DFI) can be defined as getting digital access to and use of formal financial services by the excluded and underserved population (Lauer & Lyman, 2015). In other words, it is the process of providing access to financial products and services and credit facilities where needed by vulnerable groups like low-income earners at affordable cost (Durai & Stella, 2019). Alexander (2017) identifies three dimensions of financial inclusion to include access to, usage and quality of financial services provided. In other words, DFI, according to Manyika, *et al.* (2016), refers to the provision of DFS to people, most especially to the unbanked as well as providing wider access to DFS to the underserved individuals and businesses.

*Digital Wallet:* Digital wallet is a store of values, accessible via the internet or mobile phone, thereby facilitating payments. Digital wallets may be connected to a conventional bank account (Manyika, *et al.*, 2016). It is like digital purse where money and financial values are kept.

*Fintech:* Financial Stability Board defines fintech as a financial innovation driven by technology which brings about novel business models, products, applications, processes. Fintech exerts influence on the ways and manners in which financial services are provided in the financial markets (Navaretti, Calzolari & Pozzolo, 2017). OECD (2018) submits that fintech is the application of new digital technologies to financial services, and the development of business models, products and services which are based on digital platforms and technologies. Furthermore, Gomber, *et al.* (2017) describes fintech as the integration of modern and internet-mediated technologies with the traditional business activities of the financial services industry.



*Mobile Financial Services:* Mobile financial services (MFS) entails the employment of mobile phones to access financial services and execute financial transactions- both transactional as well as non-transactional services. MFS include M-Banking, M-payments, M-money (AFI, 2016; Kambale, n.d.). Similarly, Macmillan (2016) defines MFS as a broad range of financial services (such as mobile money and banking services) rendered via mobile network.

In M-banking (mobile banking), mobile phones are employed in accessing banking services and executing financial transactions, which are related to only customers who have accounts banks (Kambale, n.d.). M-payments refer to mobile payments, and it is a mobile money transfer (MMT) made in return for goods or services received. MMT is the process by which bank account holders transfer mobile money between themselves via a mobile telecommunications service (Macmillan, 2016). Mobile money allows people to effect payments using their mobile phones without the need for a conventional bank account (Manyika, *et al.*, 2016).

*E-banking:* E- banking is the execution of banking transactions via electronic platforms whether internet mediated or not internet-mediated. Abaenewe, Ogbulu and Ndugbu, (2013) classifies e-banking into three basic types, namely, internet banking, smart card banking and mobile banking. In internet banking, customers, via the internet, give instructions to the bank to effect certain banking transactions. In smartcard banking, banking transactions are executed via electronic cards such as value card, debit card, credit card, ATM cards, etc (Abaenewe, *et al.*, 2013). Mobile banking involves the conduct of banking transactions and accessing of transactional and non-transactional banking services through the use of phones (Abaenewe, *et al.*, 2013; AFI, 2016).

*Sustainable Digital Finance:* Sustainable digital finance (SDF) involves the application of DF or fintech for the attainment of the sustainable development goals (SDGs). SDF integrates both the environmental, social and governance (ESG) agenda and business goals of sustainability, corporate social responsibility, and multi-capital or shared value (UNEI, 2018).

In addition, some other key terminologies related to DFS according to AFI (2016) are presented in Table 1.

Table 1: Some Digital Financial Services' Terminologies

Terminologies	Meaning
Branchless banking	The provision of financial services by banks and other FSPs, outside of traditional bank branches.
Cash merchant	A type of agent that only conducts cash-in/cash-out services.
Cash-in	The process by which a customer exchanges cash for electronic value. They are often an addition to the customer's e-money account.
Cash-out	The process by which a customer exchanges electronic value for cash. They are often a deduction from a customer's e-money account.
Cash point	All locations where users can perform cash-in and/or cash-out transactions, and other places where DFS services are offered.
Mobile network operators	A company licensed by government to provide telecommunications services through mobile devices.



Terminologies	Meaning
Electronic money	A type of monetary value electronically recorded, issued upon receipt of funds, accepted as a means of payment by parties other than the issuer, and redeemable for cash.
Electronic payment	Payment made via electronic channels, including mobile and internet channels, using infrastructure such as mobile phones, computers, electronic cards, and POS devices.
Electronic funds transfer	Any transfer of funds initiated through an electronic terminal, telephone, mobile phone, tablet, phablet, computer system or magnetic tape in order to authorise payment services provider to debit or credit a customer's bank or e-money account.

Source: AFI (2016).

### 3. Nomenclatures of Digital Finance: Researchers' Perspective

Some researchers have carried out studies on DF. Their findings are reviewed and reported here. In addition, the different nomenclatures of DF employed by these researchers are presented in table 2. Shofawati (2019) conclude that the availability of digital finance could create financial inclusion, and access to financing, most especially by SMEs is facilitated due to DF. In the same vein, Bett and Bogonko (2017) assert that digital finance technologies positively impact financial returns of banking institutions. In another study, from the review of the implication of digital finance on financial inclusion and financial stability, Ozili (2018) also found that DF positively impact financial inclusion. There is no doubt about it that consumers of financial services are shifting from traditional channels to digital ones and the multi-channel model is the popular trend now in the banking industry (Van, Uyen, & Phuong, 2015). Karlan, *et al.* (2016) also concluded that digital finance can significantly enhance client well-beings both directly as well as indirectly through enabling a broader ecosystem. However, in Kenya, Agufa (2016) found that DFS impacts financial inclusion negatively. This may be due to the fact banks in Kenya, in the study period, adopted digital finance in order to reduce operating cost and not as an instrument of financial inclusion. In the same vein, Onwe (2013) found that I.T. facilitates financial intermediation through cost reduction and timely delivery of financial services. In another related study, Jaksic and Marinc (2015), argues that though the economics of banking has not changed but there is a need for banks to tailor its products and services to meeting the requirements of its digitally-inclined customers. Furthermore, Durai and Stella (2019) conclude that DF has a significant impact on financial inclusion.

Babarinde, et al. (2019) list some financial innovations including ATM, phone banking, internet banking, agency banking, smart cards, debit cards, credit cards, applications, POS technology; as well as other technological innovations like the internet of things (IoT), cloud computing, big data, block chain technology, nanotechnology, artificial intelligence, quantum computing, data analytics. These technological advances are capable of affecting the financial services' landscape both now and in the future. However, the direction of impact depends on how individuals, business and governmental organisations brace up for the challenges the technological innovations pose.

Presented in table 2 are nomenclatures/ measures of DFS used by different scholars in their investigations.



Table 2: Nomenclatures of Digital Finance

Terms used for DF	Authors
Mobile banking/phone banking	Abassi and Weignand (2017), Agufa(2016), Durai and Stella (2019),Harelimana (2017), Kambale (n.d.), Kayveci and Wolfs (2018)
Internet banking	Abassi and Weignand(2017), Agufa(2016), Durai and Stella (2019),Kambale (n.d.), Kayveci and Wolfs (2018)
Online banking	Abassi and Weignand (2017), Harelimana (2017)
Electronic banking	Abassi and Weignand (2017), Harelimana (2017)
Branchless banking	Abassi and Weignand (2017)
Mobile money	Abassi and Weignand (2017), Kambale (n.d.)
ATMs	Kambale, (n.d.), Kayveci and Wolfs (2018)
Debit cards	Durai and Stella (2019)
Credit cards	Durai and Stella (2019), Kayveci and Wolfs (2018)
Agency banking	Agufa (2016)
Mobile wallets	Durai and Stella (2019)
Point of Sale (POS)	Kambale (n.d.), Kayveci and Wolfs (2018)
TV-based banking	Harelimana (2017)

Source: Author's compilation from the literature, (2020).

#### 4. Current and Emerging Technologies Influencing Financial Services

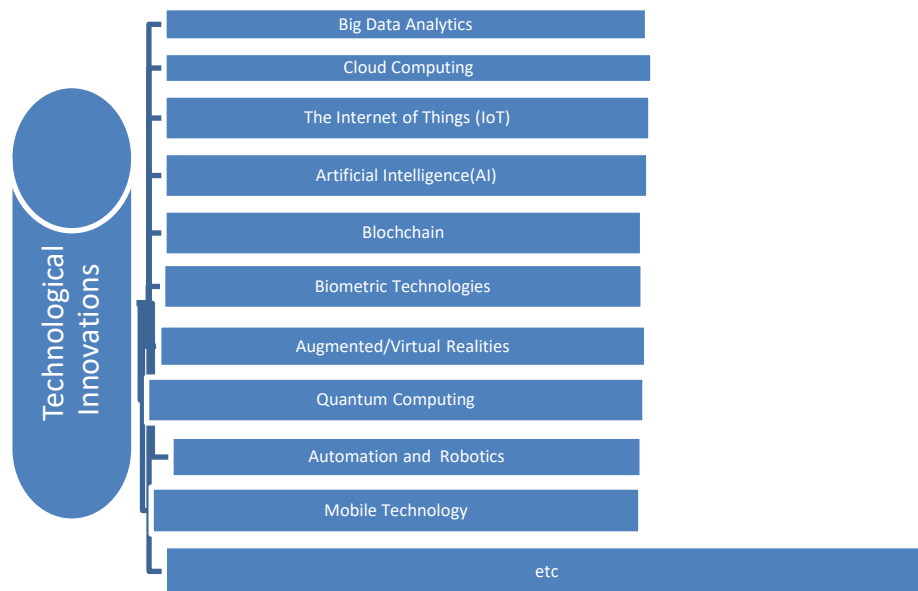
The current advances in telecommunications and computing technology are a dominant force in the transformation of finance. Some of the emerging technologies that are applicable to financial services industry include cloud computing, big data, the internet of things, artificial intelligence, augmented/virtual realities, block chain and biometric technologies (OECD, 2018). In addition, CGAP (2015) adds to the list, digital data trails, P2P social connections, smart and rich user interface, real-time customer interaction, instant verification, and remote sensing. Others mentioned by United Nations (2019) as affecting the evolving digital economy include 3D printing, automation and robotics. Furthermore, UNEI (2018), mentioned as part of the above list of technologies: machine learning, mobile technology, and advances in web-based financing applications.

Figure 1 presents some current, new and emerging technologies affecting the entire financial services' landscape.

Block chain, otherwise called distributed ledger technology, is a decentralised ledger or a list of all transactions across a peer-to-peer network, which enables the transfer of values across the internet without a central third party (Price Waterhouse Cooper [PWC], 2016). This database technology facilitates the creation, transfer and storage of information. For instance, cryptocurrency bitcoin is underlined by this technology (OECD, 2018). In these vein, big data is described as the amount of complex and large sets of data created from the digitalisation of day-to-day activities. Big data are derived from text, numbers, images, video, audio clips, and data generated by communication and other devices. The processing and analysis of big data are facilitated by I.T. (OECD, 2018). As a source of big data, the internet of things (IoT) is a set of connected devices which captures information concerning movement and other sensing data of objects in the physical world. The IoT is capable of providing very rich information concerning



the behaviours of individuals, and the resulting data can be employed for tailoring of products, risk profiling and pricing (OECD, 2018). Cloud computing is an internet-based development and employment of computer technology which enables computing and data to be moved away from desktop and portable PCs into large data centres (Institute of Chartered Accountants of Nigeria, 2009). This technology facilitates the provision of real-time scalable data processing and storage at an affordable cost. It expands the ability of FSPs in the domain of data collection and analysis. Furthermore, it also enables growth in data analytics and applications (OECD, 2018).



*Figure 1: Technological Innovations Applicable in Financial Services*  
*Source: Author's Compilation from the literature, (2020).*

As an advanced way of analysing big data, artificial intelligence (AI), is often used in connection with machine learning, whereby technology is enabled to execute activities that human beings are capable of doing. Examples of such activities are recognition, understanding, learning, problem solving, reasoning and decision making (OECD, 2018). Furthermore, OECD (2018) posits that biometric technologies capture human physiological or behavioural features. They are applicable in fingerprint scanning, iris scanning, face recognition, voice authentication, and gait recognition. In the same vein, OECD (2018) also describe augmented and virtual realities as novel ways by which individual consumers' interactions with their environment occur. The distinction between the two realities is that while augmented reality portrays an enhanced view of the real physical world in which individuals exist, virtual reality, on the other hands, creates a simulated world view of the reality.





## 5. Conclusion

This paper is on the conceptual review and analysis of digital finance. Various definitions as well as concepts associated with digital finance were reviewed. In addition, proxies for digital finance employed in different empirical studies were reviewed. Some emerging technologies that exert influence on the financial services landscape were also examined. It was discovered that different authors define digital finance in different ways, but some common factors run through the different definitions reviewed. The review reveals that digital finance broadly encompasses digital products and services, digital technologies, digital infrastructures/architectures, digital agents/providers, digital platforms, digital business operations and process, digital benefits, as well as human interface involved in the provision of financial products and services to digitally-savvy and desirous customers.

The study also agreed with the findings of Oracle (2016) that digital disruption and revolution has come to stay and is taking place in the financial services sector at a speed of light and the speed of the changes taking place now will intensify further in the near future. This brings about the need for more research by scholars, government and corporate bodies in the area of digitalisation of finance. Therefore, digital finance, being a relatively novel subject matter in finance, needs more intensive and extensive studies, in order to give it the deserved popularisation to reap the benefits it is capable to deliver.

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