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*Artículos Científicos*

## **Empresas fintech, activos virtuales y la era digital: retos y oportunidades en México**

***Fintech Companies, Virtual Assets and the Digital Age: Challenges and Opportunities in México***

***Empresas Fintech, ativos virtuais e a era digital: desafios e oportunidades no México***

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### **Resumen**

En la era de la 4° revolución industrial y la disrupción financiera, las tecnologías de la información, la innovación tecnológica, la inteligencia artificial y activos virtuales, entre otros conceptos, han cambiado el modo de vida de la sociedad, el uso de los teléfonos inteligentes para realizar actividades económicas, los medios de pago e inversión que han pasado de los métodos tradicionales de la banca al manejo de los activos virtuales y, el internet como plataforma de uso; sin embargo el tema tecnológico aún resulta desconocido para una gran parte de la población, para otro sector, resulta un camino innovador de inversión y negocio y desafortunadamente para otros, es una fuente para cometer ciberdelitos. Realizando un escrutinio de los diversos conceptos que giran en el entorno de la era digital y analizando la apreciación de diversos especialistas en la materia, se realizó una investigación de tipo descriptiva documental y, utilizando el método deductivo se revisaron las diferentes fuentes de información especializada con el objetivo de profundizar sobre las características de los criptoactivos, activos virtuales y las empresas Fintech, así como los retos y

oportunidades que enfrentan en la era de la cuarta revolución industrial y la nueva legislación aplicable en materia, así como el riesgo y la vulnerabilidad de éstas empresas a ser utilizadas en la consecución de los ciberdelitos como el fraude y el lavado de activos entre otros, que toman fuerza con la situación actual de la pandemia originada por el COVID-19.

Las empresas Fintech utilizan la innovación digital para ofrecer servicios financieros más eficaces y económicos a la población que no cuenta con la banca tradicional, actualmente teniendo que ajustarse a la nueva normativa regulatoria para su operación, considerando que México ocupa el 2° lugar en ciberataques, representa un gran reto que todos los usuarios de las tecnologías financieras desarrollen la cultura de implementar ciberseguridad con el objetivo de, prevenir la consecución de los delitos cibernéticos. Asimismo, considerando el contexto actual antes descrito, se crea la oportunidad para el crecimiento y desarrollo económico de las empresas Fintech y los usuarios de las tecnologías financieras.

**Palabras clave:** activos virtuales, disrupción, tecnologías financieras.

### **Abstract**

In the 4th industrial revolution and financial disruption stage, the information technologies, technological innovation, artificial intelligence and, virtual assets, among another concepts, have changed the society way of life, the use of smart telephones to carry out economic activities, the payment and investment methods have gone from the traditional methods of banking to the management of virtual assets and, the internet as a platform for use; however, the technological issue is still unknown for a large part of the population, for some sector, it is an innovative way of investment and business, but unfortunately for others, it is the source for cybercrime. Carrying out a search of the various concepts considered in the environment of the digital age and analyzing the appreciation of various specialists in the field, a documentary descriptive research was carried out and, using the deductive method, the different sources of specialized information were reviewed with the aim of go through the characteristics of crypto assets, virtual assets and also Fintech enterprise, as well as the challenges and opportunities they face in the era of the fourth industrial revolution and the new applicable legislation on the matter, as well as the risk and vulnerability of These companies to be used in the pursuit of cybercrimes such as fraud and money wash, among others, that are taking hold with the current situation of the pandemic caused by COVID-19.

Fintech companies use digital innovation to offer more efficient and economic financial services to the population that do not have traditional banking, currently having to adjust to the new regulatory issues for its operation, considering that Mexico ranks 2nd place in cyber attacks, It represents a great challenge for all users of financial technologies to develop the culture of implementing cybersecurity with the aim of preventing the achievement of cybercrime. Also, considering the current context described above, the opportunity for economic growth and development of Fintech companies and users of financial technologies is created.

**Keywords:** virtual assets, disruption, financial technologies.

### Resumo

Na era da 4ª revolução industrial e da crise financeira, as tecnologias da informação, a inovação tecnológica, a inteligência artificial e os ativos virtuais, entre outros conceitos, mudaram o modo de vida da sociedade, o uso do telefone inteligente para realizar atividades econômicas, os meios de pagamento e de investimento que passaram dos métodos tradicionais de banco para a gestão de ativos virtuais e a internet como plataforma de uso; No entanto, a questão tecnológica ainda é desconhecida para grande parte da população, para outro setor, é uma forma inovadora de investimento e negócios e, infelizmente, para outros, é fonte de prática de crimes cibernéticos. Realizando um escrutínio dos diversos conceitos que giram no ambiente da era digital e analisando a valorização de diversos especialistas da área, foi realizada uma pesquisa documental descritiva e, utilizando o método dedutivo, as diferentes fontes de informação especializada foram revistas com O objetivo de aprofundar as características dos cripto ativos, ativos virtuais e empresas Fintech, bem como os desafios e oportunidades que enfrentam na era da quarta revolução industrial e a nova legislação aplicável na matéria, bem como o risco e vulnerabilidade das Essas empresas devem ser utilizadas na perseguição de crimes cibernéticos como fraude e lavagem de dinheiro entre outros, que ganham força com a atual situação de pandemia provocada pelo COVID-19.

As empresas Fintech utilizam a inovação digital para oferecer serviços financeiros mais eficientes e econômicos à população que não conta com serviços bancários tradicionais, atualmente tendo que se adequar às novas normas regulatórias de seu funcionamento, visto que o México ocupa o 2º lugar em ciberataques, É um grande desafio para todos os usuários de tecnologias financeiras desenvolver uma cultura de implementação da segurança

cibernética com o objetivo de prevenir a realização de crimes cibernéticos. Da mesma forma, considerando o contexto atual descrito acima, abre-se a oportunidade para o crescimento e desenvolvimento econômico de empresas Fintech e usuários de tecnologias financeiras.

**Palavras-chave:** ativos virtuais, disrupção, tecnologias financeiras.

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## Introduction

In the era of the fourth industrial revolution, concepts such as crypto assets, virtual currencies, bitcoin, eros and financial technologies, among others, flow in the digital economy creating guidelines that users, financial services companies and authorities must bear in mind with the purpose of carrying out fast and efficient financial operations to implement normative legislation that regulates them. In fact, the use of financial technologies has changed the way of life of society, since it encourages financial inclusion and the decrease of cash as a payment method. In effect, the investment and settlement media have gone from traditional banking methods to managing virtual assets, online purchases and sales, and the internet as a platform for use. Even so, the technological issue is still unknown to a large part of the population, which can serve as a source for committing cybercrimes. For this reason, it is important to delve into these types of concepts, which must be understood and operated so that they are not used to our detriment.

Indeed, and as a background, it can be said that Mexico ranks second in terms of the achievement of cybercrimes, hence measures have been created to regulate technological operations and to prevent these financial crimes. An example of this is the enactment of the law to regulate financial technology institutions (fintech law) published in the Official Gazette of the Federation on March 9, 2018. This law regulates operations, authorizations, electronic payments, transactions with virtual assets, as well as their inspection and surveillance. In this way, it seeks to protect consumers and ensure the confidentiality of customer and user information. However, until before the legislation was issued, there were around 515 fintech companies operating, a figure that decreased to 85 after the implementation of said rule.

In this context, the following questions arise, which have guided the development of this investigation: does the use of financial technologies in economic purchase-sale

operations represent a risk or growth possibilities for users? What are the challenges and opportunities that fintech companies face today when trading virtual assets? Can these operations and companies be used to commit cybercrimes or financial crimes?

## Method

This work was based on a descriptive-documentary research, since a scrutiny of primary and secondary information sources available on the Web was carried out. To do this, the deductive method was used and the concepts and theories on financial technologies, crypto assets and fintech companies were reviewed (what type of operations they carry out and what is the applicable legislation), what are the characteristics of the virtual assets that operate in the financial markets, what crimes can be perpetrated in the use of financial technologies and what regulations and procedures must be followed to prevent them. In summary, the objective was focused on analyzing the challenges and opportunities facing fintech and the use of financial technologies, as well as what regulation and prevention measures they must adopt in the current space of financial disruption, the digital age and the pandemic caused by covid-19.

## Theoretical framework

The technological revolution, industry 4.0 or smart industry <sup>1</sup> they constitute the entire globalized context of the digital age, which is based on the use of the internet. Analyzing some technological concepts chronologically, in the first instance the word bitcoin appears, which was born in 2009 and is defined as an independent and decentralized virtual currency<sup>2</sup> that can be used as a means of payment just like physical money (Finanzas para Todos, 2010, para. 1). Its operating mechanism is summarized in this way:

[Download] software on the computer or our mobile that will act as a virtual wallet and that will generate a bitcoin address, which can be used to send and receive money from other users. In addition, the sending of bitcoins is instantaneous and all operations can be monitored in real time. Transactions

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<sup>1</sup> La cuarta revolución industrial busca transformar a la empresa en una organización inteligente para conseguir mejores resultados del negocio (CIC, 2019).

<sup>2</sup> Concepto que indica que no está controlada por ningún estado o institución financiera, banco o empresa. (BE, 2010).

with this currency involve a transfer of value between two bitcoin addresses, public, although anonymous. To guarantee security, transactions are secured using a series of key cryptographies, since each account has a public and a private key. (*Finanzas para Todos*, 2010, párr. 4).

Now, the concept of crypto assets is defined as follows:

Set of digital assets and new goods and services based on cryptography and the blockchain for its operation. Represents the values from which an economic benefit is expected in the short, medium or long term (...). A digital asset is that which exists only in binary form and that gives certain rights to its holder. This is because you can use, enjoy and have the asset (Garrido, 2019, párr 3).

This concept was born with Wei Dai<sup>3</sup> In 1998, and after almost 20 years in the virtual market, it became the means of investment and payment that has shown great interest for the various benefits it generates, but also for the illicit uses that criminals have given it .

In 2014, the Financial Action Task Force<sup>4</sup> (GAFI) issued the document entitled Virtual currencies: main key definitions and potential risks in PLD / CFT <sup>5</sup>, where cryptocurrency is defined as "mathematically based decentralized convertible virtual currency that is protected by cryptography, that is, it incorporates the principles of cryptography to implement a secure, decentralized and distributed information economy" (GAFI, 2014, p. 5).

On the other hand, the term financial technologies and the word fintech are referred to in the digital newspaper Oro y Finanzas in this way:

Fintech (...), an acronym for two English words Financial Technology, that is to say financial technology, has become the ubiquitous term to refer to any technology applied to financial services. It could be defined, therefore, as technological innovation in financial services following the pattern of what has been done from the technology sector with the media, tourism and

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<sup>3</sup> Reconocido criptógrafo y miembro de la comunidad *cyberpunk*, muy conocido por sus aportes al campo de estudio. En el mundo de las criptomonedas, será recordado por situar una propuesta clave precursora de bitcoin justo antes de la creación de Satoshi Nakamoto y por la librería "crypto++" (Bit2me, 2015).

<sup>4</sup> Institución intergubernamental creada en 1989 cuyo propósito es desarrollar políticas que ayuden a combatir el blanqueo de capitales y el financiamiento al terrorismo.

<sup>5</sup> Prevención de lavado de dinero / combate de financiamiento al terrorismo.

telecommunications industries in the last 15 years (*Oro y Finanzas*, 2015, párr. 2).

Taking as a reference that disruptive technologies are considered innovative changes that modify the different conditions of our environment or way of life, then financial technologies refer to companies that use digital innovation to offer more efficient and economical services that can also be offered to the population that does not have traditional banking to make purchases and shipments digitally in electronic purses (wallets) through smartphones.

One of the financial inclusion policies of June 21, 2016 was to increase the use of technological innovations; Consequently - and according to the results of the 15th Study on Internet User Habits in Mexico 2018, (AIM, 2019), the number of Internet users in 2018 grew 4.3% compared to the previous year, who mainly used desktop computers (20%) and mobile devices (28%). Along with this increase, however, it is also worth noting that the number of cybercrimes has increased, such as identity theft, credit card forgery, attack on company servers, hacking of bank accounts, as well such as the theft of confidential information from public and private organizations. In fact, "in 2017, cybercrime cost the world economy \$ 600 billion, which represents .08% of global GDP, according to data from McAfee and the CIIS (Center for Strategic and International Studies)" (Staff, 2019 , para. 3).

At present, crypto assets or virtual currencies claim to be or have been used by criminals as a new method for money laundering. This means that technologies have become the operating mode of economic activities, hence the financial inclusion of taxpayers has become an objective set by the federal administration 2012-2018 to issue regulations aimed at preventing this new modality. criminal.

### **Fintech companies**

Fintech companies can be conceived as entities that offer financial products and services through the use of information and communication technologies, such as internet pages, social networks and mobile applications, which would provide a less expensive service than that offered by the traditional banking (National Commission for the Protection and Defense of Users of Financial Services [Condusef], 2017, para. 1). Table 1 shows the most important verticals of these companies, according to the Fintech Association in Mexico:



**Tabla 1.** Diversos servicios de empresas *fintech*

Servicios	Particularidad
Medios de pago y transferencias	Plataformas de pago, comercio electrónico y orientada internacionales.
Infraestructura para servicios financieros	Evaluación de riesgo, perfiles de clientes y de riesgo, prevención de fraudes, verificación de identidades API <sup>6</sup> bancarias, agregadores de medios de pago, inteligencia de negocios, ciberseguridad y contratación electrónica.
Contratación digital de créditos	Empresas que ofrecen productos de crédito a través de plataformas electrónicas.
Soluciones financieras para empresas	<i>Software</i> para contabilidad e infraestructuras de facturación y gestión financiera.
Finanzas personales y asesorías financieras	Administración de finanzas personales, comparadores y distribuidores de productos financieros, educación financiera, asesores automatizados y planeación financiera.
Mercados financieros	Servicios digitales de intermediación de valores, instrumentos financieros y divisas.
Crowdfunding	Modelo de financiamiento colectivo donde diferentes personas de diversas partes del mundo realizan pequeñas o grandes aportaciones financieras a un determinado proyecto.
Insurtech	Tecnología aplicada a la prestación de servicios en el sector asegurador
Criptomonedas y blockchain	Desarrolladores de soluciones basados en blockchain, intermediarios digitales y mercados de activos tangibles.
Entidades financieras disruptivas	Bancos u otras entidades financieras 100 % digitales.

Fuente: Elaboración propia con base en Fintech México (s. f.)

The services described in table 1 represent a practical way of carrying out the various operations offered, while eliminating physical contact between service providers and users, a situation that can be exploited by criminals for, for example, money laundering.

Fintech companies have their origin in the 1950s with the issuance of the first credit cards. Then, in the 1960s, the first ATMs emerged, and in 1970 electronic shares began to become popular, which was strengthened in 1990 with the flourishing of electronic commerce and later with the creation of PayPal.<sup>7</sup> in 2002 (Hipodec, 2018, para. 3). In the specific case of Mexico, Mejía (2019) points out the following:

<sup>6</sup> *Application programming interface.*

<sup>7</sup> Plataforma de pago asociado a una tarjeta de crédito o débito que se utiliza para las compras en línea con el beneficio de no proporcionar los datos personales al vendedor o proveedor de servicios.



The 515 fintech companies that exist in Mexico, since 2015 have raised capital and debt for an amount equivalent to 629 million dollars. In terms of employment, the Fintech ecosystem has created 3,600 direct jobs and benefits more than 4.5 million registered users of its services. Of the total number of companies, 80% are already operating: 48% are in the growth and expansion stage, and 355 are ready to scale (párr. 3).

Fintech companies are easier for users to operate. In addition, the scope and speed to carry out the different transactions that are offered are more attractive. In this regard, Hipodec (2018) refers:

Unlike banking institutions, Fintech companies offer new possibilities to people who do not need to handle complicated accounts, as well as having a more disinterested geographical scope; However, as they continue to grow, they continue to consolidate (and require) operating and behavior policies to provide greater security, which still cannot be compared to large corporations. (párr. 5).

Given the need to regulate the operational framework of so-called fintech companies, on March 1, 2018, the law to regulate financial technology institutions (called fintech law) came into force, as well as the issuance of Character Provisions General (DCG) applicable to these companies, published in the Official Gazette of the Federation (DOF) on September 10, 2018 and modified by means of a resolution dated March 25, 2019, which empowers the National Banking Commission and Values (CNBV) for the following:

[Issue DCG] under the principles of financial inclusion and innovation, competition promotion, consumer protection, preservation of financial stability and technological neutrality and that said provisions include requirements to act as a financial technology institution, minimum capital, accounting, exceptions to receive cash resources or make and receive national or international transfers (...) in order to allocate resources to schemes for the alignment of incentives of collective financing institutions, evidence on risks, methodologies on assigning the degree of risk to applicants for resources in collective financing institutions and business continuity plan among others (CNBV, 2019a, párr. 3).

The National Banking and Securities Commission refers that Mexico occupies the seventh place worldwide in the regulation of the fintech sector and indicates that there are around 330 companies; However, in a statement dated October 1, 2019, the CNBV stated that after the end of the period to request authorization to operate as financial technology institutions, it only received a total of 85 companies, of which 60 requested authorization to operate. as electronic payment fund institutions and 25 as collective financing institutions (CNBV, 2019b, para. 1).

The main figures contemplated by the regulation and supervision of the Ministry of Finance and Public Credit and the National Banking and Securities Commission are summarized in table 2:

**Tabla 2.** Instituciones *fintech* supervisadas por la CNBV

Institución	Operaciones
Instituciones de Fondos de Pago Electrónico (IFPE)	<ul style="list-style-type: none"> <li>- Emisión, administración y redención de saldos de dinero registrados electrónicamente para hacer pagos o transferencias.</li> <li>- Pueden realizar operaciones en moneda nacional y virtuales.</li> <li>- Pueden actuar como transmisor de dinero.</li> <li>- Pueden comercializar, emitir o administrar medios de disposición.</li> </ul>
Instituciones de Financiamiento Colectivo (IFC) (Crowdfunding financiero)	<ul style="list-style-type: none"> <li>- Autorización para realizar operaciones de financiamiento (deuda<sup>8</sup>, capital o copropiedad).</li> <li>- Régimen de divulgación de riesgos.</li> <li>- Un proyecto no puede ser financiado por más de una IFC.</li> <li>- No está permitido ofrecer rendimientos garantizados.</li> </ul>
Activos virtuales (criptomonedas)	<ul style="list-style-type: none"> <li>- Las IFPE e IFC podrán operar con los activos virtuales autorizados por Banxico.</li> <li>- Banxico definirá las condiciones y restricciones de las operaciones realizadas con activos virtuales.</li> <li>- Cualquier institución que maneje activos virtuales deberá sujetarse a la regulación aplicable en materia de PLD.</li> </ul>

Fuente: Elaboración propia con base en CNBV (2018a)

<sup>8</sup> Las que corresponden a deuda deben usar al menos un buró de crédito (CNBV, 2018a, párr. 7).

As can be seen, before the implementation of the regulations to operate under the fintech figure, these companies were around 515; However, only 85 entities obtained authorization from the CNBV to perform the services indicated in table 2. Such authorizations are granted by the Inter-institutional Integration Committee, which is made up of two representatives of the Ministry of Finance and Public Credit, two Banco de México and two from the National Banking and Securities Commission, with a total of six members and one of the CNBV officials serving as its president.

The General Provisions issued by the CNBV applicable to financial technology institutions are made up of four titles, various chapters and sections, as well as a list of annexes for both electronic payment institutions and collective financing institutions (financial crowdfunding ). The second title, chapter I, describes the information and documentation to request authorization to operate as ITF, as well as other requirements that had to be met for its operation in terms of the corporate bylaws, public instrument, business plan, documents of policies regarding risk control, responsibilities of operations, operational control processes, customer identification, conflict of interest resolution and fraud prevention of operations with resources of illicit origin, accounting, valuation of securities and others financial instruments, as well as virtual assets (Complete document in general provisions applicable to financial technology institutions).

### **Virtual assets**

Technology has different conditions to perfect the operations carried out by financial service providers. The regulation established by the CNBV indicates that the Bank of Mexico (Banxico) will define the conditions and restrictions for the operations carried out with virtual assets. In this regard, Banxico points out this:

Virtual assets emerged as a proposal for an alternative scheme to make payments, in which the participation of a trusted third party in the process of a transaction is avoided. However, due to their characteristics, these assets have presented various problems to be a substitute for currency, since they do not meet the characteristics of money: store of value, medium of exchange or unit of account (Banco de México [Banxico], s. f. párr. 1).

Banxico describes the general characteristics to differentiate the currency of legal use or financial product and virtual assets, as described in table 3:

**Tabla 3.** Características generales del efectivo, transferencia electrónica y activo virtual

	<b>Efectivo</b>	<b>Trasferencia electrónica</b>	<b>Activo virtual</b>
Posesión	Billetes y monedas	Registros de los saldos de las cuentas de depósito que lleve una institución financiera.	Posesión de una llave privada que permite iniciar transferencias dentro del registro distribuido de dicho activo.
Almacenamiento	Físico	Digital, almacenado en los registros de la institución financiera.	Digital, almacenado en los nodos de la red distribuida del activo virtual.
Método de intercambio	Físico	Digital, mediante instrucciones de transferencia a la institución financiera que lleve a su cargo las cuentas de depósito.	Digital, mediante un mensaje que se envía a la red del activo virtual a través de internet.
Doble gasto	Se evita mediante el intercambio de algo tangible (billetes y monedas).	Se evita a través de la validación de los saldos en las cuentas de depósito que lleve a su cargo una institución financiera.	Se evita mediante la validación de tenencia a partir de la revisión del registro distribuido que contiene el histórico de las transacciones, así como mediante el proceso de minado.
Falsificación	Se evita mediante elementos de seguridad físicos que evitan la duplicación de billetes.		
Respaldo	Banco Central	Institución financiera que lleve a su cargo las cuentas de depósito y los registros de los saldos.	No hay un respaldo; está basado en la confianza de sus usuarios en la red del activo virtual.

Fuente: Banxico (s. f.)

### Crypto assets

Cryptocurrencies are virtual assets that are easy to use, since they can be applied to make payments or any other commercial operation. Currently - and according to the information referred to by CoinMarketCap (2020) - until April 22, 2020 there are 5,392 cryptocurrencies with a market capital of \$ 205,250,839 billion pesos. Among the most used crypto assets, table 4 highlights the following:

**Tabla 4.** Criptoactivos más utilizados

Bitcoin	El más antiguo y líder en el mercado, de gran aceptación y confianza para la comunidad que lo utiliza. Ofrece eficacia, transparencia, seguridad, anonimato y comisiones aceptables tanto para invertir como para ser utilizado como medio de pago.
Ethereum	Criptodivisa rentable para invertir con plataforma que ofrece excelentes propuestas a los usuarios, permite la creación de contratos inteligentes.
Ripple	Utiliza un proyecto de <i>software</i> libre y se encuentra en el <i>ranking</i> de las criptomonedas más rentables en el mercado, y las más usadas para realizar transacciones financieras a nivel global, en tiempo real, de forma descentralizada y segura.
Litecoin	Criptomoneda descentralizada con mayor rendimiento. Permite enviar y recibir dinero sin importar la distancia; posee ventajas y beneficios para usuarios e inversionistas.
Bitcoin cash	Criptomoneda sólida, que cumple con la promesa original del bitcoin, es decir, “dinero electrónico par a par”. Los usuarios y comerciantes son beneficiados con tasas bajas y confirmaciones confiables. De adopción global, innovación sin necesidad de permisos y desarrollo descentralizado.
Golem	El proyecto pretende ser una alternativa para los proveedores centralizados de servicios en la nube, con su precio más bajo y código abierto para la comunidad de desarrolladores. Las transacciones entre los participantes se consideran seguras porque los cálculos se llevan a cabo en el sandbox.
Agrocoin	Criptomoneda para invertir en el campo mexicano; creado por una empresa que produce y comercializa chile habanero, ofrece rendimientos anuales.
Trueusd	Criptomoneda estable que se encuentra respaldada por dólares americanos. Sus usuarios poseen completa garantía de sus activos y tienen el derecho de cambiar los tokens por dinero fiduciario en dicha moneda.

Fuente: Elaboración propia con base en Molina (2019) y Cash (2020)

The crypto assets described in table 4 can be classified as follows:

- Cryptocurrencies for payment, as is the case of bitcoin, ripple and bitcoin cash.
- Virtual assets as a means of products or services such as Ethereum or Golem.
- Virtual assets with underlying or adjacent, as is the case of agrocoin and trueusd.

The use of crypto assets in various operations has advantages and disadvantages, some of these are explained in table 5.

**Tabla 5.** Ventajas y desventajas de los criptoactivos

Ventajas	Desventajas
Se puede tener un monedero sin necesidad de disponer de acceso a los servicios bancarios.	Las transacciones son irreversibles.
Los pagos se realizan de forma casi instantánea, no importa en qué parte del mundo estén el emisor y el receptor.	Alta volatilidad y cambios drásticos en su cotización.
Las operaciones son directas, los usuarios tienen el control total sobre su dinero.	Por su fase de desarrollo no existen aplicaciones necesarias para utilizar el criptoactivo de forma fácil y sencilla.
Las comisiones al realizar transferencias de valor son muy bajas; los mismos usuarios pueden decidir qué tasa quieren pagar para dar velocidad a la operación.	
Utilizan un sistema basado en tecnología <i>blockchain</i> , un servicio gratuito y abierto para todo el mundo.	

Fuente: Elaboración propia con base en Chacón (s. f.)

### The crime of money laundering

The crime of money laundering, typified in article 400bis of the Federal Criminal Code, referred to as “Operations with resources of illicit origin”, traditionally called money laundering, currently represents approximately 5% of the world's gross domestic product (GDP). Regarding this crime, Mexico has been in a constant fight to prevent it, following the recommendations made by the FATF as a result of the mutual evaluations carried out (the first in 2008 and the last in 2018). They mainly indicate that the country has a PLD / CFT regime that has had significant improvements in some areas. These assessments also indicate that the authorities and the financial sector have a good understanding of the risks and threats posed by such a regime. In addition, the strengths and weaknesses of the Financial Intelligence Unit, as well as the Office of the Attorney General of the Republic, are pointed out regarding the importance of monitoring the confiscation of the assets derived from the crime or the identification and diligence of the real beneficiary of the resources. (Complete mutual evaluation report in Mutual Evaluation Report 2018). In summary, the FATF recognizes financial innovation, as well as the products and services of “virtual currencies (VM) (VCPPS<sup>9</sup> for its acronym in English) that present risks of money laundering and

<sup>9</sup> Virtual Currencies Key Definitions and Potencial AML/CFT Risks.

terrorist financing (ML / FT) and other crime risks that must be identified and mitigated ”(GAFI, 2015, para. 1).

The DCGs state that any of the fintech companies constituted as electronic payment fund institutions or collective financing institutions that operate with virtual assets authorized by Banxico must abide by the applicable regulation in matters of PLD. The CNBV (2018b, para. 7) refers to the measures

as and minimum control procedures that financial technology institutions (ITF) must comply with the following obligations regarding PLD / FT:

- Manual of PLD / FT.
- Risk assessment methodology.
- Internal structures (compliance officer, interim compliance officer and communication and control committee).
- Automated systems.
- Reports.
- Audit report.

The PLD / FT manual must include a client identification policy, which must indicate that ITFs are obliged to integrate files of each of their clients prior to the conclusion of contracts, provision of services and performance of operations, as well as requesting them the geolocation of the mobile electronic device from which the account is opened or the contract is signed. Likewise, they must have an automated system that performs functions such as preserving, updating data and documents, validating their authenticity provided remotely, generating and transmitting the different reports to the secretariat through the CNBV, guaranteeing traceability and certainty of origin and destination of the virtual assets with which they operate, classify the types of operations, products or services, monitor and group in a consolidated base the different operations of the same client and include a risk-based methodology, among others. Likewise, ITFs must comply with the applicable regulations on the sending of reports, among others, that of operations with virtual assets.



## Results

What are the challenges and opportunities facing fintech and the use of financial technologies? The results are presented in chronological order. Bécares (2017), a year before the implementation of the regulation in Mexico indicates that, in an analysis carried out to officials of Aceleradora Startupbootcamp, Prestadero and Afluenta Eduardo Morelos (Para. 4) mentions that “Fintech companies are gaining greater prominence seeking to give solution through technology to problems where the traditional industry has not been able to reach”. Likewise, Gerardo Obregón (Para. 5), general director of Prestadero, points out that “although there is a sector of the population that still mistrusts the new options of financial services, this is a barrier that will disappear with the new generations. It is a gradual process, but with a lot of effort from us to inspire confidence”. Alejandro Cosentino (Para. 6), founder and CEO of Afluenta, explains that “in the Mexican scene, more than 50% of people have a smartphone and consider it the first device in terms of general usage preferences; they no longer want to go to a bank branch”.

Among the challenges, Demetrio Strimpópulos (Para. 6), director of BanRegioLABS, considers that “the development of Fintech entrepreneurship will be strengthened if we create an adequate collaborative environment between the different actors: banking, entrepreneurs, capital funds and regulatory entities”. Obregón (Para. 7) believes that “the main challenges are regulation and financial education”, also notes “that Fintech and new technologies are increasing competition and increasing options for consumers.” Alejandro Cosentino (Para. 8) —of Afluenta— believes that, “explaining clearly and simply to Mexican users how Fintech improves the conditions of loans between people, as well as providing information on the transparency of operations carried out respecting the local regulatory framework”. Cosentino (Para. 10) also mentions “in the digital age, the natural tendency is towards this type of services and that resources are optimized, financial inclusion and user experience are favored”.

On March 1, 2018, the fintech law comes into force, and the CNBV reports that only 85 of the 303 companies of that nature obtained permission to operate as ITFs. Cobis (2019) refers that new generations such as millennials set the tone for fintech companies, as they seek to develop simpler processes than those of traditional banking. (Para. 6) However, they also want to reach more people, in the same document Adrián Fernández de Mendoza, (Para. 7) CEO of Creditea México mentions: “The segment of people who was born must be taken

into account. digital, and that is why it is difficult to operate between rigidity and informality. It must act like traditional banking to reach older people, but at the same time project an innovative and avant-garde image ”.

Regarding virtual assets, in Deloitte (2019) Carlos Orta - Risk Advisory partner at Deloitte Mexico - explains that Banxico points out in its circular 4/2019 the risks that currently exist when operating with them, which he classifies as volatile, expensive and difficult to scale (Para. 6); Orta highlights the dangers that the holders of these assets face, mainly due to the complexity of the technology that supports them and the ignorance that most of them have about their functionality and about the problems that may arise. (Para. 3) In addition to this, the underlying risk in terms of money laundering and terrorist financing must be taken into account, as assets can easily be transferred to other countries, hence the need for uniform preventive measures globally. (Para. 6)

In an interview conducted by Gutiérrez (2019) in the Economist, Pablo González - co-founder of the cryptocurrency exchange Bitso - pointed out that although cryptocurrencies have come to stay, there are still a series of challenges that they have to face in order to have greater adoption; In the case of Mexico, for example, although there is already a law to regulate these types of assets, technology can advance faster than regulation. González also explained that since Bitso began operations in Mexico, adoption has been gradual, but constant.

We estimate that currently the market size in Mexico is 800,000 users using cryptocurrencies (...). The market is large, but we would like it to reach a higher percentage of the population. There are still people who are unaware of the benefits of bringing technology into their lives and we want to turn these stigmas around. (Párr. 4)

In general terms, the evolution has gone from a technological transformation to having cases of real uses, such as remittances or payments. Regarding the fintech law, González pointed out that it is a great precedent to establish clear rules of the game, both for regulators and for consumers and industry participants. In the world of innovation, it is normal for technologies to advance faster than regulation, so a wide openness is required to understand the benefits of these new technologies. Regarding cryptocurrencies, he mentioned that those of us who work in the sector are not the only ones who believe that cryptocurrencies are here to stay. A report published by Greenwich Associates in September 2019 mentions

that 70% of executives in the financial sector also believe that cryptocurrencies are here to stay, hence the development of this technology has begun. In the Sierra de Puebla there are Mexicans who collect remittances from their relatives in the United States through bitcoin, even though they do not understand what this technology is or how it works. The important thing for them is to receive the money and trust in a more transparent, fast and convenient service. In short, “its use is already improving the lives of a large number of families in our country” (Para.10).

On April 20, 2020, in an interview with the LFB Daniel Alberto Ortiz de Montellano Velázquez, manager, Forensic, of the KPMG firm in Mexico indicates:

What is the outlook for Fintech companies today?

In general, all companies are having a technology boom; not just banking services, with the disruption of financial services and considering that a large part of the population is the generation of millennials. These companies are growing, a lot is being invested in them and they are becoming saturated.

Do operations with virtual assets in the current situation represent a risk for their users?

In general, any investment is risky. From the beginning of investments, “the higher the investment, the higher the return”, however, operations with virtual assets are not risky due to the blockchain with a 100% traceable transaction; the risk is due to the volatility they have.

What advantages and disadvantages do you consider to exist when trading virtual assets?

One of the advantages is that you can maximize returns because the investment is 100% traceable; The disadvantages, among others, are that it is an unknown topic for many, so they can be victims of fraud.

In what situation are Fintech companies established in Mexico and with permission to operate issued by the CNBV in relation to other international Fintech companies?

The law in Mexico was very limiting by only allowing certain activities. It was a good exercise. However, it leaves us at a disadvantage, since anyone can go to the other side of the world to establish a Fintech and operate with virtual assets in Mexico without having to be physically in Mexico. Many countries have understood this and have not wanted to establish regulation. For example, in Hong Kong there is no regulation for Fintech; what exists is

regulation for virtual banks that constitute a part of the Fintech industry a little more advanced.

What are the risks of Fintech and the operation with virtual assets?

The risks are focused on cybersecurity crimes in general, financial crimes, including fraud and money laundering, since 100% face-to-face contact with the client is being eliminated and this always generates a risk, so it should be taken a good IT security infrastructure such as Firewall, etc., can be very vulnerable.

How could the crime of money laundering occur in Fintech companies?

For example, in Crowdfunding you can ask that you are financing a project that in the end is not real or that the resources are not going to be used for the purposes of the project, or financing with illicit resources of "x" project that in the end is not It is real, in virtual assets there is every black market where you can buy from pornography, passports and false identities.

What would be the strategy to be able to apply a good knowledge of the client?

Use technology: from facial recognition, biometrics, identity tests, among others. To the extent that technology is used to meet the customer and obtain their consent to integrate the aforementioned data, in addition to real-time monitoring, predictive tools, not so much analytics, give you a good knowledge of the customer.

How does the current pandemic crisis impact these types of operations?

It impacts for the better, because in the end, with the pandemic, face-to-face contact is eliminated, and this is precisely one of the benefits of these companies. Not only Fintech companies but all technological disruption are expected to grow in the covid-19 crisis.

What type of PLD / CFT program would you implement in these types of companies?

Any PLD program must have four components: policies, systems, training and auditing in this type of companies must be focused. That is, policies must be highly technological with robust systems, focused auditing and training must be directed towards the risks to which they are exposed.

Regarding the current issue of the pandemic, KPMG (2020) -in the KPMG trends newsletter- refers that in the midst of the crisis caused by covid-19 and the flow of information associated with the pandemic, the following cyber crimes may occur:

**Tabla 6.** Modelos de fraudes tecnológicos

Delito	¿Cómo se ejecuta?
Phishing (suplantación de identidad)	El objetivo es llegar a las víctimas a través de los correos electrónicos con anexos maliciosos, enlaces o actualizaciones sobre covid-19. Una vez abiertos, dichos vínculos infectan la computadora o dispositivo móvil con algún programa maligno ( <i>malware</i> ) o exponen datos personales confidenciales que se transmiten al ciberdelincuente.
Sitios webs fraudulentos relacionados con covid-19	Múltiples dominios de internet han sido registrados con el nombre de covid. Estos parecen ser auténticos y creados por organizaciones reconocidas, sin embargo, contienen <i>malware</i> diseñado para infectar las computadoras u otros dispositivos móviles.
Riesgos relacionados con el correo empresarial	Mediante el uso de correos electrónicos disfrazados de actualizaciones de covid-19, los estafadores intentan engañar a los colaboradores de las empresas para que entreguen sus credenciales, y después solicitan que inicien sesión en un falso portal covid-19 de la organización. Una vez que la persona ingresa con sus credenciales, el defraudador obtiene acceso ilimitado a las cuentas empresariales y a la red de la compañía.
Ataques de ransomware (secuestro de datos)	El primer paso que realizan los estafadores es comprometer la seguridad de los servidores críticos y las terminales conectadas para después encriptarlas. El ataque bloquea el sistema operativo y los archivos del usuario final y no se pueden acceder hasta que se pague un rescate al atacante, quien suele demandar el pago en bitcoins. A medida que el acceso remoto a las computadoras se convierta en la norma “para trabajar en casa”, se espera que un incremento de estos ataques paralice la infraestructura de las tecnologías de la información de las organizaciones hasta que los delincuentes logren cobrar los rescates.
Otras estafas mediante aplicaciones móviles	Los defraudadores están desarrollando o manipulando aplicaciones de telefonía móvil que aparentan rastrear la propagación de la covid-19. Sin embargo, una vez instalada la aplicación se infecta el dispositivo con <i>malware</i> , que se puede utilizar para obtener información personal, datos confidenciales o información de las cuentas o tarjetas bancarias.
Otras estafas	Solicitud de donaciones para entidades que no existen y que aparentemente están ayudando a comunidades afectadas por la covid-19 o bien compañías que están desarrollando vacunas para su prevención.

Fuente: Elaboración propia con base en KPMG (2020)

## Discussion

Fintech companies, virtual assets, crypto assets and cybercrimes are concepts that emanate from technological innovation and financial disruption, and are booming in the fourth industrial revolution, hence various experts have analyzed the different challenges and opportunities faced by companies. fintech for its operation as ITF. Among the opportunities, it can be highlighted that they seek to reach and improve the traditional banking system reaching more sectors of the population, with simpler, faster, more efficient and cheaper

financial services that are provided through mobile devices. Fintech companies also need investment of both financial resources and trained human capital for their development (the latter can be covered with the participation of millennials or the digital, multi-screen and hyper-connected generation).

Among the challenges, the adequate collaboration between the actors (banking, entrepreneurs, capital funds and regulatory authority) stands out with the aim of optimizing resources, favoring financial inclusion, creating trust and security, and the experience of users. In addition to this, it is important to highlight that fintech companies must also act as traditional banks to reach older people, although without neglecting the innovative and avant-garde image.

As explained throughout these pages, operations with virtual assets are a reality, since more than 800,000 users operate with these currencies (which are currently approximately 5,392). However, it must also be emphasized that companies and individuals in general must strengthen their cybersecurity systems. In addition, entities must obtain permission to operate as an ITF in order to safeguard the integrity of consumers and prevent the pursuit of cybercrime.

Likewise, for the proper use of financial technologies and the proper identification of the client, electronic processes must be applied, such as facial recognition, identity tests or biometric data. These techniques are still unknown by some sectors of the population, so they must be carried out with the authorization and consent of customers and users.

In relation to the recent regulation for ITFs, it has been argued that it was very limiting, since it only allows the performance of certain activities. In addition, the use of technologies advances faster than regulations, which can cause these companies to be incorporated in other countries, but operate in Mexico without having a physical presence.

With the current COVID-19 pandemic, fraudsters often use technological means to commit cybercrime (eg, financial fraud, scams, data hijacking, among others), so users should be attentive to prevention measures that different organizations and authorities spread. This logically represents a great challenge due to the amount and flow of information that circulates in the networks, as well as the ignorance of these, a reality that increases with the performance of operations and economic activities that take place on the internet platform in the so-called "home office".

## Conclusions

In the current context generated by covid-19, millennials and the massive use of smartphones have generated the need and the challenge of using virtual assets, crypto assets and financial technologies. This, of course, has favored the financial inclusion of consumers and has caused a decrease in the use of cash to carry out commercial operations, which, however, has also resulted in an increase in illegal activities in the Mexican economy.

In this complex context, companies incorporated as fintech make a great contribution to the Mexican economy both in terms of employment and services provided. Therefore, the entities that did not obtain permission to operate as ITF have the challenge of complying with the requirements requested by the authority, since in this way they can collaborate with banks, entrepreneurs and regulatory entities for the benefit of consumers, clients and users.

In the midst of this pandemic, and considering that Mexico ranks second in terms of cyberattacks, companies are required to promote a culture of cybersecurity among users in their different technological teams in order to prevent the attainment of virtual crimes, such as identity theft (phishing) and money laundering. Considering the majority of economic activities are currently carried out through electronic means, the operation, security and vulnerability of the use of financial technologies, virtual assets and fintech companies in economic activities, as well as the challenges that this implies.



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