

Reproduced with permission from Tax Management International Journal, 50 TMIJ No. 12, 12/03/2021. Copyright © 2021 by The Bureau of National Affairs, Inc. (800-372-1033) <http://www.bna.com>

How Blockchain Can Unlock the Chain of Transfer Pricing Complexity

*By Karnik Gulati, Ankit Saraogi, and Loveena Manaktala**
Chartered Accountants
Mumbai and New Delhi

ABSTRACT

The authors deliberate upon the blockchain enabled environment for conducting transactions — its origin, architecture, and the types of blockchain, as well as the stigmas holding back some of us from embracing the technology in toto. They also delve into the functions and advantages blockchain potentially offers to businesses in the form of security, integrity, accountability, confidentiality, automation, and more. They further discuss key differences between a centralised

and decentralised environment, and how a decentralised environment using blockchain can be integrated with various aspects of transfer pricing including supply chain management, value chain analysis, functional analysis, intragroup payment settlements, streamlining the audit proceedings, etc.

In recent years, the Organisation for Economic Co-operation and Development (OECD) and G20 countries have successfully implemented most of the action plans in the OECD's Base Erosion and Profit Shifting (BEPS) project through introduction of the Multilateral Taxation Instrument (MLI) which was agreed upon in 2017. More recently, a broad agreement on Pillar One and Pillar Two proposals, wherein the G20 Inclusive Framework (136 out of 139 members¹) agreed to grant taxing rights to market jurisdictions and apply a minimum tax rate of 15% to effectively eliminate tax havens, added further impetus in this whole movement against tax havens while recognising the importance of market jurisdictions in today's ever-changing modus operandi of carrying out businesses. While there is still a long way to go in implementing Pillars One and Two, the broad agreement has ensured unanimity toward a common direction.

Now that the countries need to work on the nuances of the deal, time is ripe for the OECD, the United Nations (UN), and other international organisations to also focus on marrying the blockchain technology with tax and transfer pricing laws in light of ever-increasing digitalisation.

This article deciphers what blockchain is and delves into how it works, then moves toward its integration with transfer pricing from both taxpayers' and tax administrations' perspective.

* The authors are Chartered Accountants based out of India. Karnik and Loveena are associated with Coinmen Consultants LLP (New Delhi) in their Tax & Regulatory practice and Ankit is associated with Ernst & Young (Mumbai) in their Technology Risk Advisory practice. They may be contacted at: cakarnikgulati@yahoo.com/karnik.gulati@coinmen.com; ankitsaraogi@yahoo.com/ankit.saraogi@in.ey.com; and loveenamanaktala1@gmail.com/loveena.manaktala@coinmen.com.

The authors would like to give due credit to Mr. Navin Reddy, Founder of Telusko Edutech, India, for creating useful content on blockchain which enabled us to understand this complex technology to some extent. Link to his YouTube channel: <https://bit.ly/3rayh1M>.

The views expressed in this article are personal and do not necessarily represent those of any organisation with which the authors are associated.

This article may be cited as 50 Tax Mgmt. Int'l J. No. 12 (Dec. 3, 2021).

¹ OECD/G20 BEPS Project, Statement on a Two-Pillar Solution to Address the Tax Challenges Arising From the Digitalisation of the Economy (8 Oct. 2021).

INTRODUCTION TO BLOCKCHAIN

The Wave of Change

Until recently, an economic transactions system without a central authority or third-party intermediary was a distant reality. People look for a central authority since they need assurance that the transactions they make are processed and completed in a fair and safe manner. However, with the blockchain technology there is no scope of having any central authority — which is the main reason why it is still not embraced completely by most of us. Yes, we are gradually gravitating toward adopting it, but it won't be a commonly used technology for some time.

When Satoshi Nakamoto (pseudonym of a person or group of persons not yet identified) in 2008 brought the concept of digital currency to the world, along with it came the blockchain technology which enabled such “cryptocurrency” transactions to be made.

With blockchains, it became possible to encode validation rules for transactions and enforce them without an intermediary. To understand how it works without an intermediary, it is important for us to first know what exactly Blockchain is, how it works, and the various terms we should be familiar with.

What Is Blockchain?

Blockchain is an open-source technology that works on peer-to-peer network without involving any central authority to validate transactions. The validation under the blockchain happens based on a consensus mechanism (explained below). It is a distributed (decentralised) ledger visible to all the participants with entire trail of transactions making it almost impossible to mutate the contents therein.

As the name suggests, “blockchain” is a chain or series of blocks containing relevant data of its own block and the “hash” (conversion encryption) value of its immediately previous block. The previous block, in turn, holds data of its own block and the hash value of its immediately previous block and, likewise, the chain continues with new additions of blocks holding their own data and the reference of their previous block.

However, it is not as easy as it sounds. The absence of a neutral “broker” and even physical records presents us with a valid concern about trust, which apparently is the most expensive thing in this world. We will discuss trust issues below.

Types of Blockchain: Public, Private and Consortium

The blockchains can be characterised into three types:

Private Blockchain (permissioned): Private blockchains usually require permission from the owner to read, write, or otherwise access the blockchain. It is rare to see a permissionless private blockchain. Transfer pricing is especially likely to have permissioned private blockchain to control who can access, read and write, and initiate transactions.

Public Blockchain (typically permissionless): Permissionless means, as the name suggests, that no permission is needed to read, write, or access the blockchain. While most public blockchains are permissionless, permissioned is also possible.

Consortium Blockchain: This is a blockchain where the consensus process is controlled by a set of pre-selected nodes (participants).

The Potential Stigmas of Trust and Security

Blockchain technology is often questioned for the trust factor and whether it can offer the security the traditional centralised structure provides. With blockchain, an understanding of concepts such as distributed ledger technology (DLT) alleviates/addresses the trust issue while hash and cryptography alleviate/address the concern about security. To help you understand how DLT, hash, and cryptography work, we have briefly explained the same in the ensuing paragraphs.

Trust: The Most Expensive Thing in the World

In a banking environment if there is no central regulator or intermediary, every transaction has the inherent “risk” that any of the parties will not abide to the terms of the agreement and there will be no way to enforce such terms. To mitigate this risk, we often trust the central regulator/intermediary, wherein, the facilitation of every transaction is recorded and processed through a central database. For example, when A transfers money to B, the central database records the transaction and debits A's account to credit B's account.

Unlike standard present-day (centralised) networks, which depend on trusted intermediaries for security and trust, blockchains create trust organically through the underlying technology of distributed networks — DLT. In the blockchain system, every peer or node or computer of all parties to a particular transaction or arrangement maintains a shared data structure — the ledger. The transaction is recorded with timestamp in this ledger, which is distributed simultaneously across all computers belonging to the participants. Below

diagrams² depict how a ledger is maintained on a centralised system vis-à-vis with DLT:

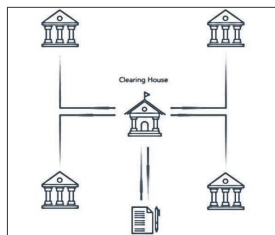


Figure 1: Centralised Ledger

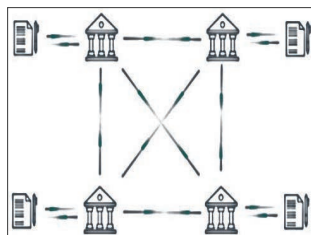


Figure 2: Distributed Ledger

While the involvement of intermediaries makes the data prone to tampering, the transactions or data on the blockchain are secure because, once recorded on DLT, they are irreversible and unalterable. Any modification of a recorded transaction requires a particular participant to pass a new entry or block on DLT in addition to original block. Such attempt will be evident to all the participants in the DLT. Hence, a transaction on DLT is permanent in nature and is technically impossible to alter.

To further simplify, the shared data structure or ledger consists of chained blocks, starting with a genesis block, containing a list of records that may be transactions in case of bitcoins, hospital records, personal data, etc. Each block in the chain is linked to the previous one through referencing its hash digest. The integration of hash security with distributed peer-to-peer network makes the blockchain secure. Figure 3 provides a representation³ of how the blocks form into a chain and its contents therein.

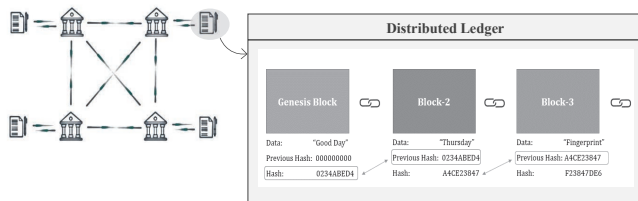


Figure 3: Blocks forming a chain a.k.a. Blockchain

Security

When the data is shared amongst all the nodes (participants) on the network, every node gets the right to access and whenever desired, change it, sometimes with the fraudulent intent. Since the ledger is stored in a decentralised fashion, with each node maintaining its own copy, ledger immutability is critical. This

² *Difference Blockchain and DLT* (30 Jan. 2018) (<https://tradeix.com/distributed-ledger-technology/>) (explains that blockchain is a specific type of DLT).

³ Venkat Kasthala, *Blockchain Key Characteristics and the Conditions to Use It as a Solution* (Start It Up, 4 Aug. 2019).

calls for a ledger that no one should be able to illegitimately change, and any changes should be evident to all the nodes in the system. This is where the blockchain comes in. As described above, any attempt to modify a recorded transaction will require a particular participant to pass a new entry or block on DLT in addition to the original block, and each block in the chain is linked to the previous through referencing its hash digest. This brings into picture the concept of cryptography and hashing.

Cryptography and Hashing

Blockchains leverage a technique integrating mathematics and computer science known as cryptography to sign every transaction (e.g., the transfer of assets, such as money, from one person to another) with a unique digital signature belonging to the user who initiated the transaction. These are private signatures that can be verified by the public. This means that if A sends money to B, anybody on the network can verify that the money was sent by A but cannot use A's signature for their own transactions. In short, the cryptographic system creates accountability while preventing identity fraud — that is, if you enter into any transaction, your signature is affixed to the transaction trail. This trail ensures that the person who carried out the transaction cannot deny having performed the same.

A hash is a cryptographic, one-way algorithm for taking data of any size and converting it to a unique piece of information of a fixed size. This is further explained in the ensuing section on block chain architecture.

Blockchain Architecture

It is important to broadly understand how the blocks are created and how they are approved to form part of the chain. This process of approving the block is known as “Consensus” (discussed under “Consensus Mechanism,” below).

Blocks

As explained above, a blockchain has a list of blocks starting with a single block called the genesis block. Each block stores the following information:⁴

Index — The Index is the position of the block in the chain. The genesis block has an index of 0. The next block will have index of 1 and then 2 and so on.

Timestamp — It is the record of when block was created. Timestamp helps to keep the blockchain in order.

Hash — A hash looks like a bunch of random numbers and letters. It is an alphanumeric value that

⁴ <https://blockchaindemo.io/>.

uniquely identifies data, or the “digital fingerprint” of data. Hash has a fixed length, and the same data always maps to the same hash. Even the slightest bit of change in the data modifies the whole hash (refer to Figure 4 and Figure 5, capturing the hash of input data generated through SHA256 algorithm⁵). It can be observed that even the slightest change in data leads to a major change in hash.

Figure 4: Hash value generated through SHA256 algorithm

A hashing function takes data as input and returns a unique hash, i.e., $f(\text{data}) = \text{hash}$

Since the hash is a “digital fingerprint” of the entire block, the data is the combination of index, time-stamp, previous hash, block data, and “nonce” (authenticating “number once”).

$$f(\text{index} + \text{previous hash} + \text{timestamp} + \text{data} + \text{nonce}) = \text{hash}$$

Figure 5: Hash value generated through SHA256 algorithm with slight modification in the previous data

Thus, for the genesis block illustrated in Figure 6, we get the following hash:

$$F(0 + “0” + 1508270000000 + “Welcome to Blockchain Demo 2.0!” + 604) = 000dc75a315c77a1f9c98fb6247d03dd18ac52632d7dc6a9920261d8109b37cf$$

Valid Hash — A valid hash for a blockchain is a hash that meets a certain requirement. For the illustrative blockchain in Figure 6, having three zeros at the beginning of the hash is the requirement for a valid

hash. The number of leading zeros required is the difficulty, a.k.a. the target difficulty.

Previous Hash — The previous hash is the hash of the previous block. The genesis block’s previous hash is “0” because there is no previous block.

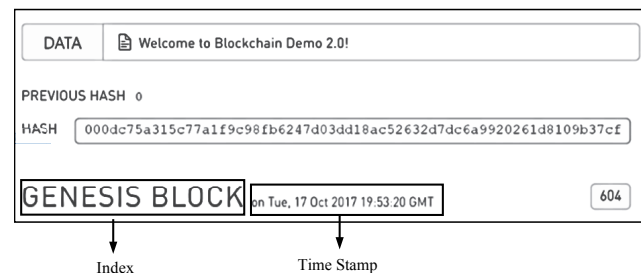


Figure 6: Genesis Block structure

Data — Each block contains data that can be as small as one letter and as large as a whole movie in high definition. In cryptocurrencies such as Bitcoin, the data would include money transactions.

Nonce — The nonce is the number used to find a valid hash. To find a valid hash, we need to find a nonce value that will produce a valid hash when used with the rest of the information from that block.

Consensus Mechanism

In the bitcoin blockchain, to include a block of transactions in the distributed database, a consensus mechanism called “Proof of work” (PoW) is activated among the nodes. Specially enabled nodes named “miners” compete in the resolution of a mathematical puzzle based on hash calculations, which is highly expensive in terms of expenditure of CPU and, by extension, electricity. The winning node has the right to register its block of transactions and additionally get a remuneration in new bitcoins. The consensus mechanism depends on the characteristics of the service: it can be very complex and expensive, such as the one described for the Bitcoin currency, or simpler.⁶ The function of the consensus mechanism is to define which block of transactions will be written in the distributed ledger, which must be unique, as well as to prevent fraudsters from breaking or damaging the blockchain. Please note the PoW is only one of the consensus mechanisms amongst numerous others. To keep it simple and concise, some other consensus mechanisms are as follows:

⁵ Other popular cryptographic algorithms are SHA0, SHA1, SHA2, SHA3, MD2, MD3, MD6, etc. SHA 256 is one of the popular versions of SHA2 that is used in verifying transactions in various crypto currencies including Bitcoin.

⁶ Antonio Seco, Bitcoin: Concepts and Potential Applications in the Tax Area (1/3) (Inter-American Center of Tax Administrations 2017).

Proof of Stake (PoS)	To validate transactions, validators must hold certain value on the network, i.e., users are encouraged to spend more until they become validators in order to create a block. With this, it becomes very expensive for any user to make any malicious changes.
Practical Byzantine Fault Tolerance (PBFT)	To resolve disputes and validate transactions among computing nodes when some of the nodes in the network fail to respond or respond with incorrect information.
Proof of Authority (PoA)	Only designated nodes on the network are given power to validate transactions or interactions with the network and to update the same.

Smart Contracts

Smart contracts in blockchain are computer programs stored on a blockchain that “self-execute” and where the outcome of any execution of the program is recorded on that blockchain. Smart contracts work on “if/when and then” condition. For example, if Company A has availed services from its subsidiary, Company B, which is a tax resident of some foreign jurisdiction, transfer pricing provisions will trigger. Now to ensure that the arm’s-length margin of, say, 10% on cost (as agreed upon between the parties) is met, the smart contracts will ensure that Company A releases the payment to Company B only if the invoice received from Company B satisfies the transfer pricing margin that both parties agreed upon.

INTEGRATION WITH TRANSFER PRICING

The Current Situation

The ever-so-increased participation of enterprises in multiple jurisdictions, with different tax rates, has given rise to multiple cross-border taxation issues. Such MNEs may manipulate the prices charged and paid in intragroup transactions to transfer tax obligations to the lower-taxed party, thereby, leading to erosion of tax revenues (the “base erosion” component of BEPS). Transfer pricing provisions were formulated to prevent this artificial (not based on actual business functions and risks) shifting of profits (the “profit shifting” component of BEPS). In a nutshell, these rules provide that the terms and conditions of transactions within the group (i.e., controlled transactions) should not differ from those of transactions with independent third parties — that is, transactions must

be at arm’s length. In other words, the arm’s-length principle (ALP) is intended to ensure that related parties don’t create artificial tax avoidance benefits for their MNE group. Where possible, transactions are compared with comparable transactions between unrelated parties at arm’s length, and terms can be established ahead of time through advance pricing agreements (APAs) between taxpayers and the tax authorities of involved jurisdictions. APAs provide tax certainty by establishing the ALP or the profit margin, as the case may be.

While the local tax authorities and OECD/UN have made numerous efforts in providing guidelines for easy application of transfer pricing provisions, both tax authorities and MNEs still encounter difficult challenges such as lack of comparable data, unavailable audit trails, absence of useful intercompany agreements, burdensome compliance processes, etc. If nothing else, these challenges have aggravated the trust issues amongst the tax authorities and MNEs. Of course, trust issues exist for obvious reasons, including notorious tax-avoiding strategies adopted by taxpayers, but not all taxpayers are alike, and some genuinely enter into cross-border transactions with related parties on same pedestal as they would with unrelated parties.

Possibilities With Blockchain

Blockchain, being immutable as discussed above, can help taxpayers streamline their internal transfer pricing framework in the following ways:

- carrying out ALP calculations automatically; any deviation from agreed terms will fail to trigger payment outflow;
- Attributing profits based on proper delineation of functions carried out, assets employed, and risks assumed by transacting entities thereby reducing the chances of transfer pricing adjustments during audit proceedings;
- Streamlining the audit proceedings, making it easier to establish trust with the tax authorities;
- Managing intragroup payment settlements, cash pooling, lending, borrowing, and guarantees; and
- Ensuring that the critical conditions of the APA are met to avoid cancellation of the same.

Blockchain as a “trust protocol” can help overcome the above-mentioned issues and mistrust between MNEs and tax authorities and streamline the implementation of the transfer pricing framework in several ways, including the following.

Intragroup Services

Intragroup services (IGS) are one of the most common type of transactions within MNEs. It is therefore

important that the taxpayers pay adequate attention to how these transactions are carried out to ensure that they are consistent with the arm's-length principle and also satisfy the need-benefit-receipt of services test. It becomes even more difficult for transacting entities to substantiate the rendition of services in the absence of proper intercompany agreements. Blockchain can be leveraged to resolve this age-old issue of IGS in following ways:

- Blockchain technology may be useful to substantiate actual receipt of the service. With the advancement of technologies such as smart contracts based on blockchain, the intragroup transactions can be automated by the means of pre-programmed codes that would keep a tab on receipt and payment of services — i.e., the payment will be processed only on actual receipt of the services.
- Smart contracts and related information captured on blockchain can assist in validation of allocation keys, which is often the very premise of litigation by the tax authorities.
- Blockchain can be used to track in-force intragroup agreements. Often it happens that the agreements are expired with no addendum entered. This is mostly unintended, of course. Blockchain will help in timely renewal and ensure no payments are processed against expired agreements.
- Whereas related-party arrangements often are conducted on an oral basis without being drawn in written form, Blockchain can ensure that no payments are made for which there are no written agreements in place.

Needless to say, the need-benefit test for IGS will continue to prevail while the actual receipt of services will be easier to prove with the immutable blockchain technology providing the entire trail of transactions. Blockchain will only help simplify the intragroup transactions, saving time and efforts in substantiating the actual occurrence of the transaction.

Effective Delineation of Transactions Through Robust Functional Analysis

Determination of an appropriate ALP is based on an in-depth functional analysis (functions carried out, assets employed and risks assumed) of the controlled transaction, often referred to as accurately delineating the actual transaction. Through this process, the transfer pricing exercise focuses on the actual conduct of the transacting entities vis-à-vis the fancy terms of intragroup agreements to identify the real value-adding entity. However, the information asymmetry may impede the effective functional analysis, leading to inap-

propriate allocation of risk and returns to the transacting entities. Blockchain can be used here to track the entire supply chain, i.e., contribution made by each entity in the value creation can be easily traceable with the automation of whole supply chain on blockchain.

Furthermore, according to the Actions 8–10 report by the OECD released in October 2015, the arm's-length principle requires that all members of the group receive appropriate compensation for any functions they perform, assets they use, and risks they assume in connection with the development, enhancement, maintenance, protection, and exploitation (DEMPE) of intangibles. With implementation of blockchain, there will be no more beating around the bush with tax authorities as each and every thing will be traceable to its original form.

Supply Chain Management

Blockchain will enable MNEs to ensure real-time visibility of all its interactions with subsidiaries, various suppliers and customers in different jurisdictions.

Availability of Data for Application of TP

Methods

Quite often taxpayers are left in the lurch looking for appropriate comparable data and must resort to the commonly used Transactional Net Margin Method (TNMM) to benchmark their transactions. With blockchain implementation bringing more comparable data to avail, methods such as Comparable Uncontrolled Price (CUP) Method and Profit Split Method (PSM) may have more practical application. In fact, we might witness wider use of PSM as taxpayers will now have better visibility on the real value creators in the group.

Furthermore, even information on comparable transactions entered within the group, where the foreign entity is considered as a tested party, will be much more easily available.

Real-Time License Payments

It is very well known that the ownership of valuable intangibles vest with a few entities in the group. These entities receive payments in form of royalties, licensing fees, etc., when any other entity in the group leverages such intangibles for their operations. However, these charges often fall prey to computational and administrative complexity. Blockchain can be useful in implementing real-time royalty or license payments as and when sales are made. This would eliminate the time gap between invoicing and payment, which may help the licensor manage its working capital requirements and also avoid litigative issues such as interest on delayed payments, etc.

Implementation of Advance Pricing Agreements

An APA includes, inter alia, the following components:

- International transactions covered;
- Agreed transfer pricing policy;
- Methodology for determining the ALP;
- Critical assumptions and terms, as may be applicable.

Once the APA terms are mutually agreed, the same may be structured in terms of smart contracts. This would mean that taxpayers and tax authorities, being the parties to the APA, shall validate the transaction based on consensus mechanism defined as per the terms of the APA. On reaching the consensus, a new block will be added to the blockchain. This will ultimately reduce the burden of annual compliance reporting and audits.

PARTING THOUGHTS

The adoption of blockchain technology is gradually increasing across industries. However, substantial adoption from the transfer pricing perspective is yet to be witnessed. It is important that all relevant stakeholders — including businesses, tax authorities, and consultants — equally embrace the use of blockchain technology to carry out their day-to-day operations of processing transactions, implementing internal controls, conducting tax and transfer pricing audits, etc., in a streamlined manner with seamless compliance. This will help not only the businesses in terms of saving precious time and resources, but also the tax authorities, by saving administrative costs to carry out audits and enforcement. Most importantly, all stakeholders will have access to real-time data with optimum assurance on the sanctity of data/information made available to them.