

LEGAL STREAM

Rise of DLTs and Blockchain – Impact of smart contracts

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Rise of DLT and Blockchain – impact of smart contracts

Today's talk

- Smart contracts
- DLT and Blockchain
- Application to energy trading

Smart contracts

“Smart contract” gets used in at least two related ways

- Smart contract code:
- Smart legal contract:

What is smart contract code?

- Computer code that, upon the occurrence of a specified condition or conditions, is capable of running automatically according to pre-specified functions
- Computer software is used to translate contract terms into code
- Encoded terms are typically conditional in nature: “If...Then...”

When (*if*) a party fulfils an obligation,
(*then*) certain actions take place automatically.

```
/* Allow another contract to spend some tokens in your behalf */
function approve(address _spender, uint256 _value)
    returns (bool success) {
    allowance[msg.sender][_spender] = _value;
    return true;
}

/* Approve and then communicate the approved contract in a single tx */
function approveAndCall(address _spender, uint256 _value, bytes _extraData)
    returns (bool success) {
    tokenRecipient spender = tokenRecipient(_spender);
    if (approve(_spender, _value)) {
        spender.receiveApproval(msg.sender, _value, this, _extraData);
    }
    return true;
}

/* A contract attempts to get the coins */
function transferFrom(address _from, address _to, uint256 _value) returns (bool success) {
    if (balanceOf[_from] < _value) throw; // Check if the sender has enough
    if (balanceOf[_to] + _value < balanceOf[_to]) throw; // Check for overflows
    if (_value > allowance[_from][msg.sender]) throw; // Check allowance
    balanceOf[_from] -= _value; // Subtract from the sender
    balanceOf[_to] += _value; // Add the same to the recipient
    allowance[_from][msg.sender] -= _value;
    Transfer(_from, _to, _value);
    return true;
}

/* This unnamed function is called whenever someone tries to send ether to it */
function () {
    throw; // Prevents accidental sending of ether
}
```

Source: <https://www.ethereum.org/token>

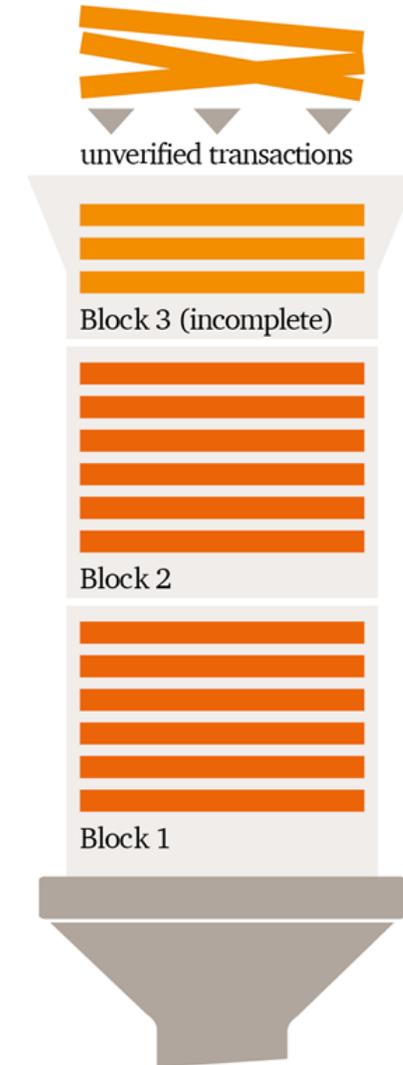
What is a smart legal contract?

Smart legal contract

- Legal contract satisfying the requirements of the relevant governing law
- Some element of the contract being electronically automated

What is Blockchain?

- Blockchain is nothing more than a digital record, or ledger, of transactions
- Unlike a traditional ledger, a blockchain is stored collectively by all of the participants in a network
- Each transaction is stored with others in a unit of data called a “block”
- These blocks securely (cryptographically) link to one another, forming a “chain” of records going back to the beginning of the ledger



Hashed transactions

Source: PWC ([Link](#))

Key Characteristics of Blockchain

Distributed

- Data is shared across equal nodes without a central authority, and each node holds a copy of the blockchain

Consensus Algorithm

- A set of rules by which a distributed network reaches agreement that information is correct and that all nodes have an identical copy

Cryptography

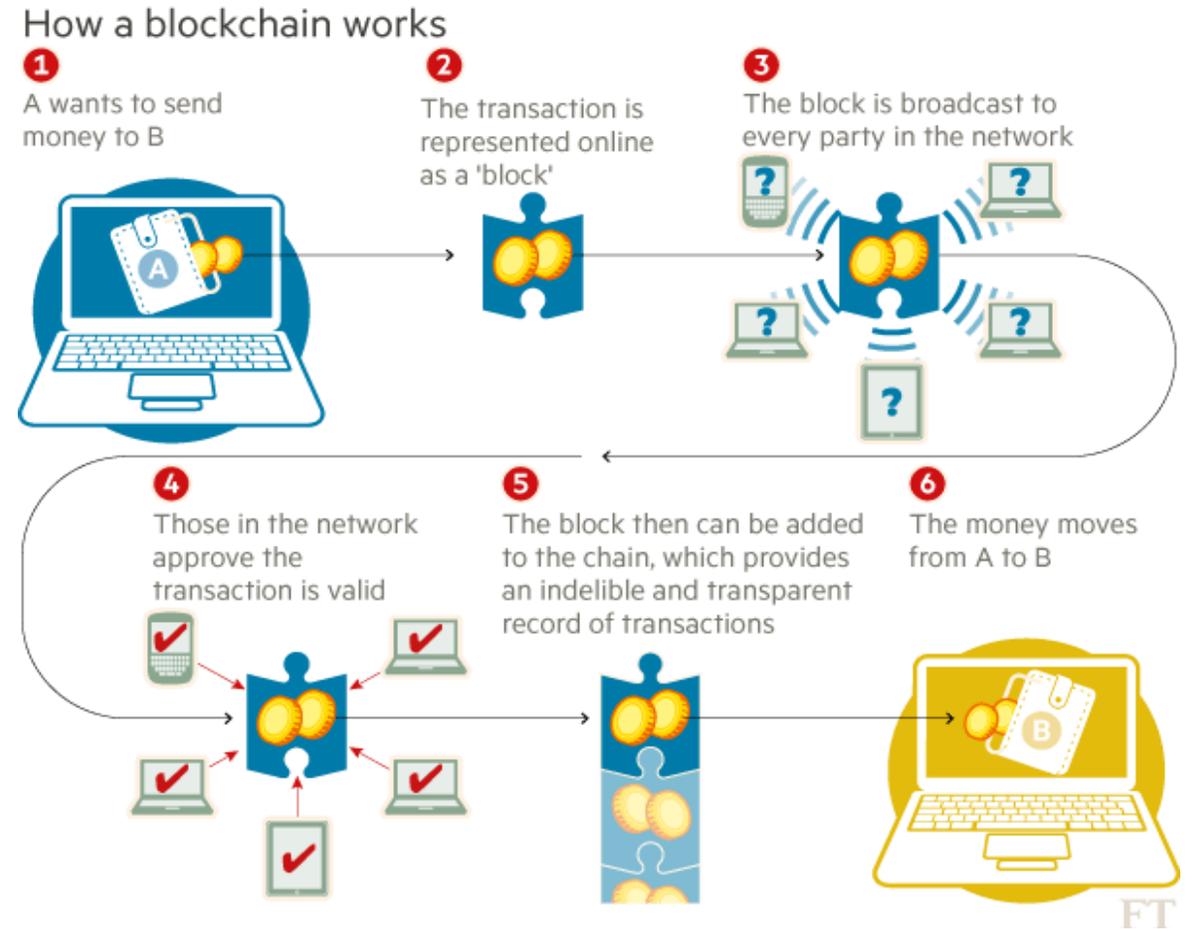
- Blockchains use algorithms and math to secure and validate transactions

Immutable

- Once a transaction has been recorded, it cannot be changed

How It Works: Validating by Consensus

- When user wishes to transfer a digital asset to another user, the users broadcast cryptographically-secured digital signatures and the details of their transaction to nearby peers on the network
- When peer participant solves mathematical puzzles required for the next block, pending transactions may be recorded into a block
- New block is double-checked by other members of the network until a majority agrees that it is correct
- Once majority consensus is achieved (usually within minutes), new block is added to chain, and pending transactions are recorded in the ledger



Smart contracts and blockchain/ DLT

Separate but related technologies

- Blockchain supports the use of smart contracts
- Smart contract code can be embedded in Blockchain/ DLT – there can be only one version which effectively binds both parties
- Imagine smart contracts without blockchain
 - Each party would have to programme its own computer
 - Parties may not be content to use the other's code

Benefits of Smart Contracts

- Smart contracts are less prone to breach because they are programmed to automatically execute after their terms have been fulfilled
- Smart contracts can bypass the many tedious steps a transaction must go through in the clearing and settlement process
- A higher volume of transactions are able to be efficiently completed at a faster rate
- Less paper means reduced costs and environmentally beneficial
- Record immutability on block chains means more transparency and user accountability

Operational and non-operational clauses

Operational and non-operational clauses

- Operational clauses embed some form of conditional logic
 - Clause requiring payment to be made on a particular date equal to the contract quantity delivered in a supply period multiplied by a price by unit
 - Clause requiring party to transfer assets on a particular date having value equal to amount by which required credit support amount exceeds value of collateral provided
- Non-operational clauses do not embed conditional logic
 - Governing law clause
 - Entire agreement clause
 - Jurisdiction clause
- Formal representation

Limits on representing contract provisions formally i.e. to allow computer software to “read” them

Limits

- Subjectivity
 - “in good faith”, “reasonable”, “best endeavours”
- Cannot enumerate all possible future situations
 - “Scheduling” in EFET contracts
- Can we really remove all ambiguity? Do we want to?

Some provisions should not be automatic or self-executing

Examples

- Single agreement clauses
- Event of Default/ Material Reason provisions?
- Smart legal contracts do not necessarily overcome risks that action will not be legally final in all circumstances
 - E.g. insolvency clawback

External and Internal models of smart legal contract

External Model

- Legal contract stays the same (natural language document) but external to it, certain conditional logic elements of the legal contract would be coded so the required actions happen automatically when the relevant conditions satisfied

Internal Model

- Parts of the contract (certain operational clauses) would be rewritten more formally so that a computer could then take that more formal representation and execute the conditional logic automatically

Internal Model

Internal Model

- How do I know the code written in the contract reflects my intentions (if I cannot read it)?
- How do I know the effect of the code when executed by a machine will be what I intended?
- Use of oracles
 - Means of replacing subjectivity with data from third party oracle

Use-cases for smart contracts

Derivatives

- Broad standardisation globally
- Appears relatively straightforward to formalise some operational clauses
 - Payments rather than deliveries

Gas and Power Trading

- Trading more localised – less broad standardisation
- Some provisions harder to formalise (e.g. broad obligations to “Schedule”)
- Formalise based on more specific Annexes?

Any questions?



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Thank you

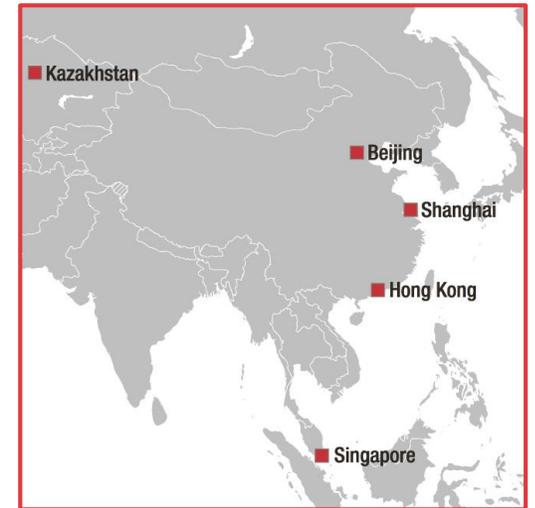
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