

A Beginner's Guide to Smart Contracts

“Smart” contracts will have a disruptive effect on traditional contractual performance, both practically and conceptually. However, are smart contracts actually “contracts” and are they really “smart”?

What are smart contracts?

Smart contracts are computer protocols, not contracts in the strict legal sense. They execute commercial transactions or enforce legal agreements in a manner that eliminates the need for intermediaries and their associated transaction costs.

Smart contracts represent a progression of blockchain technology from a financial transaction protocol (e.g. bitcoin) to a multi-purpose mechanism to effect business activities involving purchases and exchanges of virtually any goods, services or rights.

Smart contracts can be stored on a blockchain, interact with external data feeds and then self-execute payments, shipments of products or other actions based on conditional logic (programmed as traditional “if-then” statements – if A occurs, then B happens), agreed verifiable proof of performance, or other trigger events. In computer code, this looks something like:

```
function payOut(address _recipient, uint _amount) returns (bool) {  
  
    if (msg.sender != owner || msg.value > 0 || (payOwnerOnly && _recipient != owner))  
  
        throw;  
  
    if (_recipient.call.value(_amount)()) {  
  
        PayOut(_recipient, _amount);  
  
        return true;  
  
    } else {  
  
        return false;  
  
    }  
  
}
```

How is a smart contract different from making purchases on the internet or setting up an automatic payment for utility bills? Generally, when you sign up online for a website you are usually directed to terms and conditions that you click to accept. Those terms and conditions are a human-readable contract. It is the same contract as you could get in hard copy just in electronic form. Laws such as the Federal Law No.1 of 2006 on Electronic Commerce and Transactions give that contract effect even though it is in electronic form.

By contrast, with a smart contract there is nothing (in theory at least) but a digital agreement. Everything from the forming of the agreement all the way to its completion happens digitally.

Uses	What the smart contract can do
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Financial Services	Trade clearing and settlement	Manage approval workflows between counterparties, calculate trade settlement amounts, and transfer funds automatically.
Healthcare	Electronic medical records	Provide transfer and/or access to medical health records upon multi-signature approvals between patients and providers.
Technology, media and telecom	Royalty distribution	Calculate and distribute royalty payments to artists and other associated parties according to the contract.
Cross-industry	Peer-to-peer transacting	Match parties and transfer payments automatically for various peer-to-peer applications such as lending, insurance, energy credits, etc.

What are the potential uses of smart contracts?

Ethereum, which is a decentralized computing platform and operating system that is built specifically for creating and executing smart contracts for the “Ether” cryptocurrency using blockchain technology, is a notable smart contract application.

However, potential uses of smart contracts extend way beyond the movement of digital currency. Smart contracts could potentially be used to create peer-to-peer versions of any business model that currently involves intermediaries who handle processing and payments for a fee (e.g. banks, security exchanges, Uber or Airbnb).

By way of example, some potential uses for smart contracts across industry sectors are described in the table below:

Smart contracts and the law

“The first thing we do, let’s kill all the lawyers” (William Shakespeare “Henry VI”, Part II, Act IV, Scene II, Line 73)

As smart contracts are automatically enforced, smart contract enthusiasts assert that this removes the need for contract law as there is no longer any uncertainty in a smart contract transaction. From a legal perspective, smart contracts may not be that simple.

In the UAE, Article 12 of Federal Law No.1 of 2006 on Electronic Commerce and Transactions allows “smart contracts” as it provides that valid and enforceable contracts can be formed by computer programs (defined as “automated electronic agents”) that include two or more electronic information systems preset and pre-programmed to carry out the transaction, even if no individual is directly involved.

The law of contract has various requirements for a contract to be valid and enforceable. For example, you cannot make an illegal contract. In the UAE a contract for gambling is illegal. You cannot have a contract to kill a person. No court will enforce such contracts.

By contrast, a smart contract is a set of instructions written in computer code that self-executes. A smart contract will do exactly what the code dictates, however ludicrous (a smart contract is not necessarily smart).

There are situations where computers cannot render contracts effectively. By way of example, written contracts frequently use wording that a party will use “reasonable endeavours”. What does that mean and how do you write that in computer code?

Other fundamental legal concepts such as “good faith” and “negligence” are also very difficult to encode. These concepts are used to give the contracting parties flexibility in respect of certain obligations by not specifically determining in advance exactly what those obligations entail.

When parties agree a traditional contract, if circumstances subsequently change, there is the possibility of varying that contract. Unless the parties build into a smart contract, at the beginning, code that allows for modifications, a smart contract is not smart enough to allow for variations.

Currently, if the meaning of a contract is disputed, a court will consider what that agreement would mean to an objective and reasonable human observer. There is no such thing as a reasonable computer. Computers do not apply common sense because they are not programmed to do so.

Despite their name, smart contracts are necessarily always strictly legal contracts. At a minimum a legal contract must include the elements of offer, acceptance and the intention of the parties to enter into a legal agreement.

Conclusion

To the extent that legal relationships can be reduced neatly into code – so that terms are automatically enforced once the pre-programmed conditions are satisfied – smart contract technology represents an unstoppable disruptive force.

At this point in time, it seems likely that there will be a continuum between smart contracts and traditional contracts depending on the underlying transaction. A very simple contract can be fully automated (the contract is entirely in smart contract code that is stored, verified and executed on a block chain.) However more complex “smart” contracts may require a combination of both self-executing terms and contractual terms that are outside the software code. This is because:

- the subject of the contract may not be readily distilled into a logic statement; and
- human judgment may still be needed to determine how aspects of the contract are to be performed.

In the future, natural language computing and artificial intelligence may also overcome these barriers as well.

What is clear now is that smart contracts will revolutionise agreement making and performance of transactions.

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