



# › WHAT IS BLOCKCHAIN?

And what can/should we do with it? | Henk-Jan Vink, Oskar van Deventer, Johan Ruiter

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**TNO** innovation  
for life

## 'Blockchain belangrijkste technologische innovatie sinds internet'

31 mei 2016

## NEN opent debat over ISO-standaard blockchain

2 JUNI 2016 12:24 | ROLF ZAAL | NIEUWS

## Blockchain biedt kansen voor waterdichte identiteitscontrole

— *Technologie*

25/05/2016

## 2016 Will Be the Year You Realize You Don't Need the Blockchain

Jan 8, 2016 | Alec Liu

## Bitcoin en blockchain geen wonderolie

Jaap-Henk Hoepman

zaterdag 2 april 2016, 6:00

Krantentitel: 'Bitcoin en blockchain zijn geen wonderolie'

## 'Overheid kan beter en goedkoper met blockchain'

19 JANUARI 2016 09:50 | ROLF ZAAL | NIEUWS

01-06-2016  Door

Nederland ICT leden kunnen zich aanmelden voor blockchain coalitie

**Blockchain's big opportunity for lawyers**  
**The Australian Financial Review** - 11 uur geleden

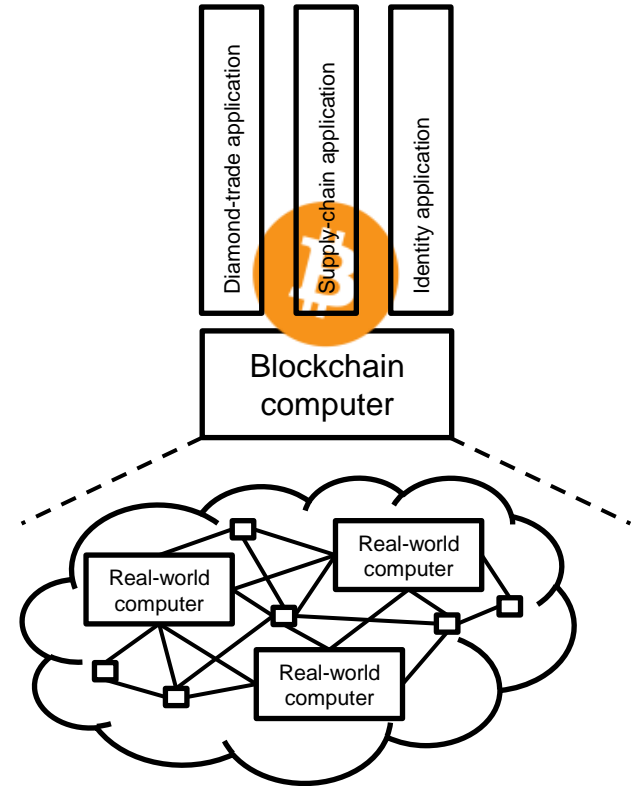
## Santander combineert blockchain met Apple Pay voor betalings-app

27 MEI 2016 14:27 | JELLE WIJKSTRA | NIEUWS

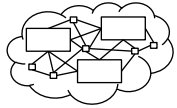
# WHAT IS A BLOCKCHAIN?

A group of computers\* together forming a super-trustable virtual shared 'computer'.

\* in bitcoin, these are called "miners"



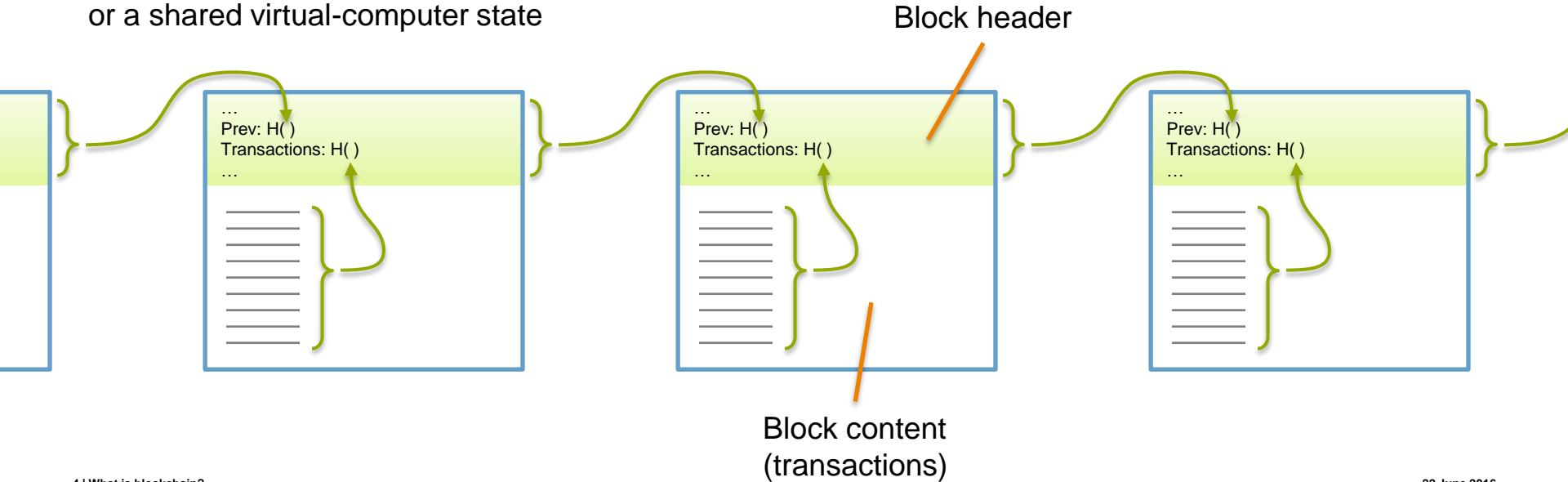
Collection of modifications of  
the 'shared truth' \*.



\* e.g. a shared transaction ledger  
or a shared virtual-computer state

Cryptographically linked  
in a chain-like fashion  
(using hash functions)

# blockchain



# BLOCKCHAIN FEATURES & CHALLENGES

## Features

Consensus

Validity

Uniqueness

Immutability

Authentication

## Challenges

Speed

Privacy

Security ?

Sustainable

Cost

# USE CASE SECTOREN

## › INDUSTRY



## › HEALTHY LIVING



## › DEFENSE, SAFETY & SECURITY



## › URBANISATION



## › ENERGY



# TNO BUILT SUPPLY-CHAIN BLOCKCHAIN DEMO

- Smart Industry: putting orders and suborders onto a blockchain

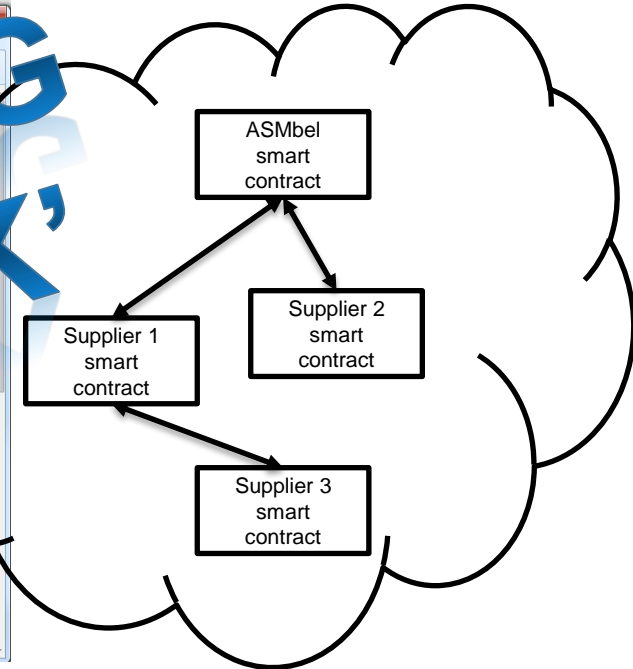
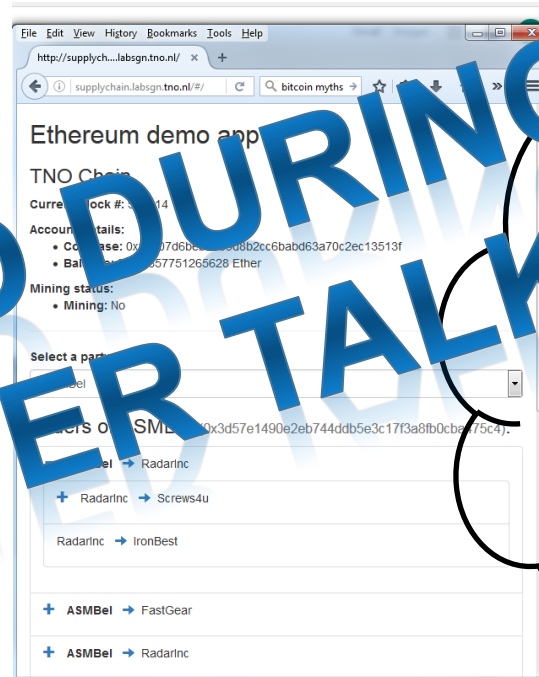
```
function placeorder(address _supplier,string _product,uint _parentorderId) returns(uint)
{
    if(msg.sender == owner && _supplier != self){
        outCount++;
        outOrderIds.push(outCount);

        Party remoteContract = Party(_supplier);
        uint extorderId = remotecall("placeorder",_supplier,_product,outCount);

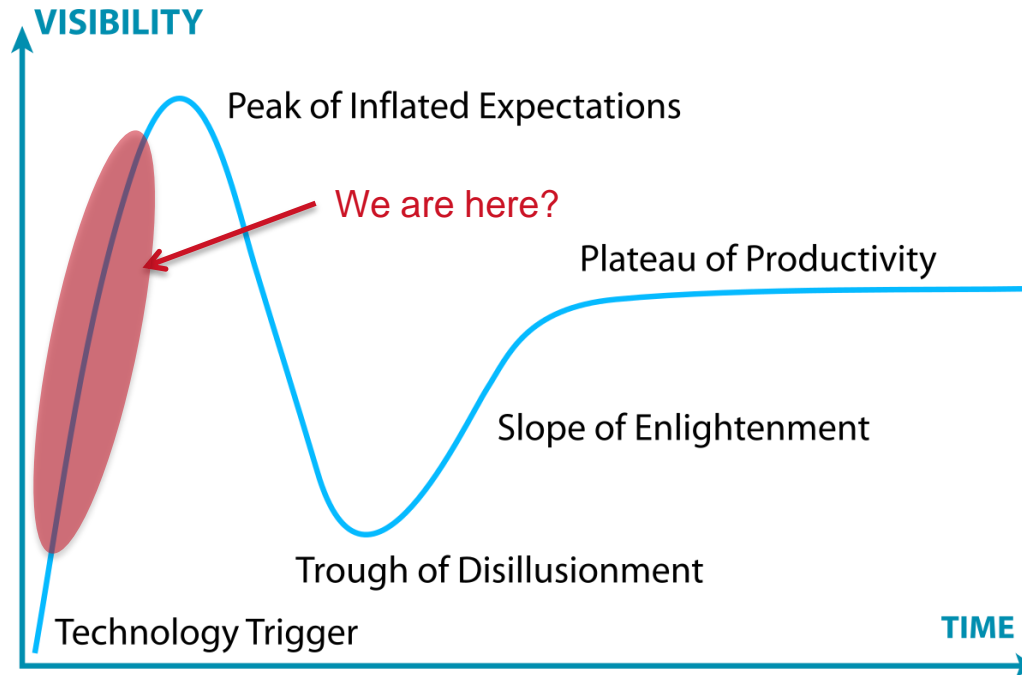
        outgoingOrders[outCount].supplier = _supplier;
        outgoingOrders[outCount].supplierorderId = _parentorderId;
        outgoingOrders[outCount].product = _product;
        outgoingOrders[outCount].parentorderId = _parentorderId;

        if(_parentorderId > 0){
            // add new order to child of parent
            if(incomingOrders[_parentorderId].childorderIds.length < 10){
                // push
                incomingOrders[_parentorderId].childorderIds.push(outCount);
            } else {
                // create new array
                incomingOrders[_parentorderId].childorderIds = [outCount];
            }
        }

        return extorderId;
    } else {
        throw;
    }
}
```



# THE BLOCKCHAIN HYPE CYCLE



**Top 10 Myths About Bitcoin**

May 13, 2016, 08:30:39 AM EDT By [Bitcoin Magazine](#)

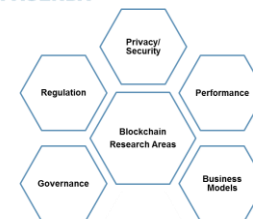


# TNO CONTRIBUTION

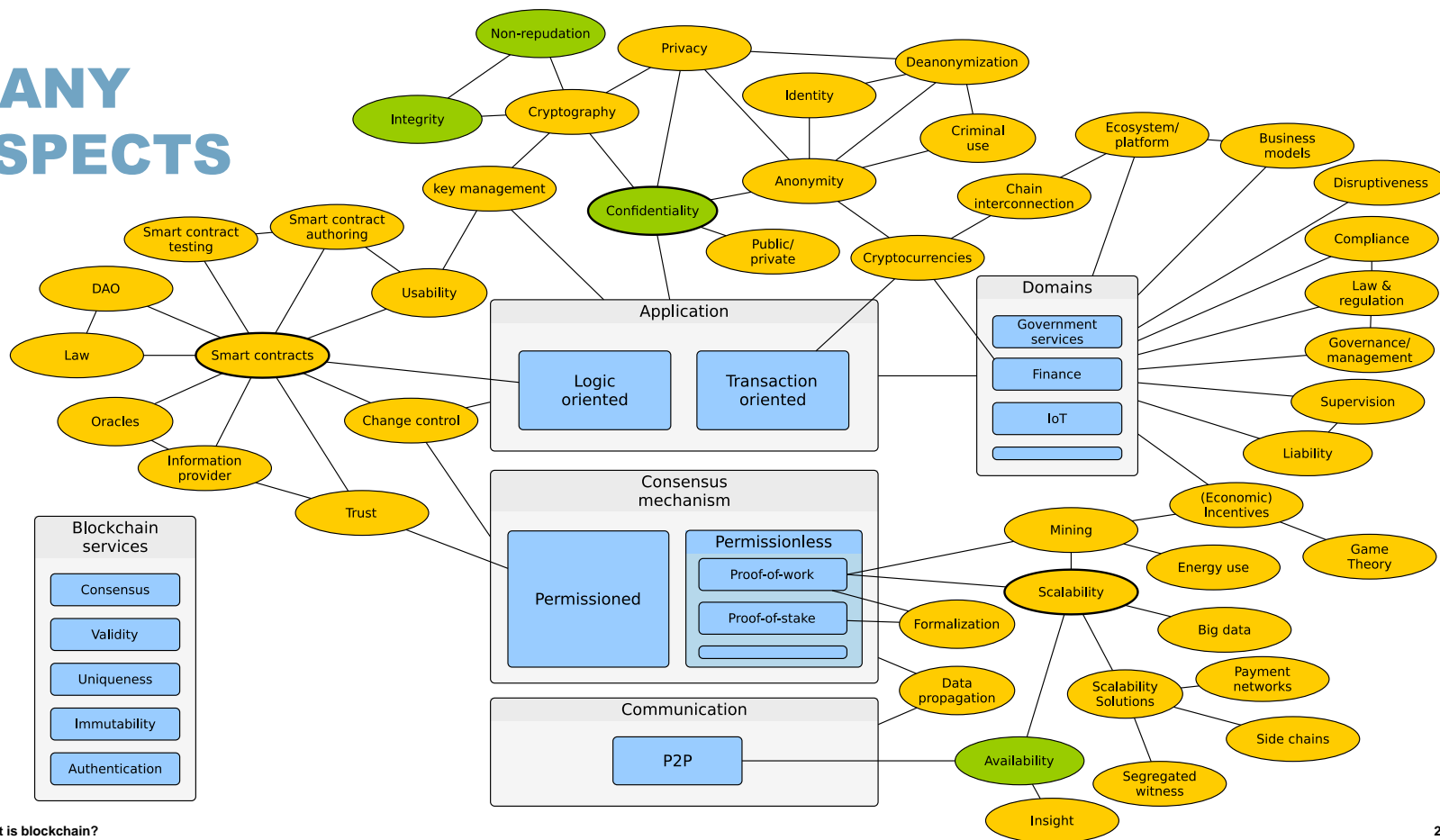


FINTECH SPECIAL ENVOY

## RESEARCH AGENDA



# MANY ASPECTS



# RESEARCH AREAS

## › INDUSTRY



## › URBANISATION



## › ENERGY



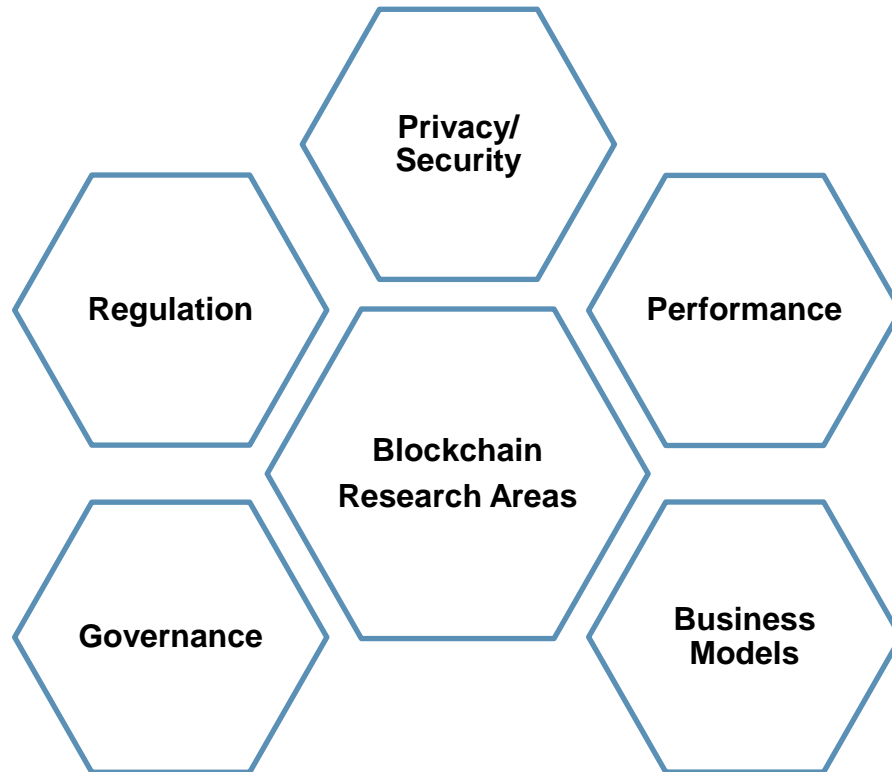
## › HEALTHY LIVING



## › DEFENSE, SAFETY & SECURITY



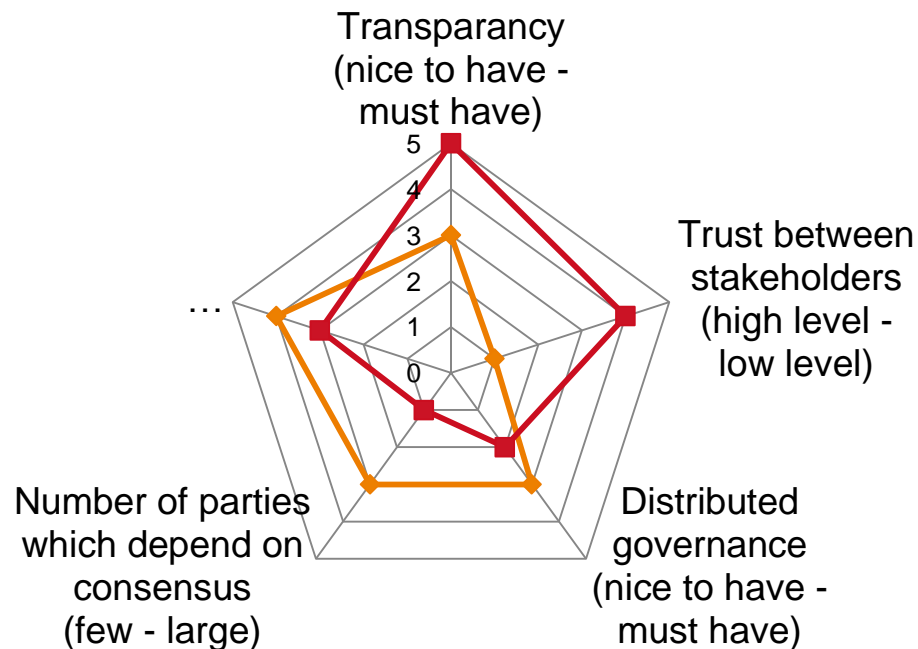
Applied research/experimentation



Academic research



# BLOCKCHAIN FIT ANALYSIS (FIRST DRAFT)



# BLOCKCHAIN, SOLUTION TO EVERYTHING (!?)



## SUMMARY

- › Block Chain could be disruptive,.....but when
- › Applied- and academic research and experimentation is needed to really understand the technology and (business) potential

› **THANK YOU FOR YOUR  
ATTENTION**

**TNO** innovation  
for life