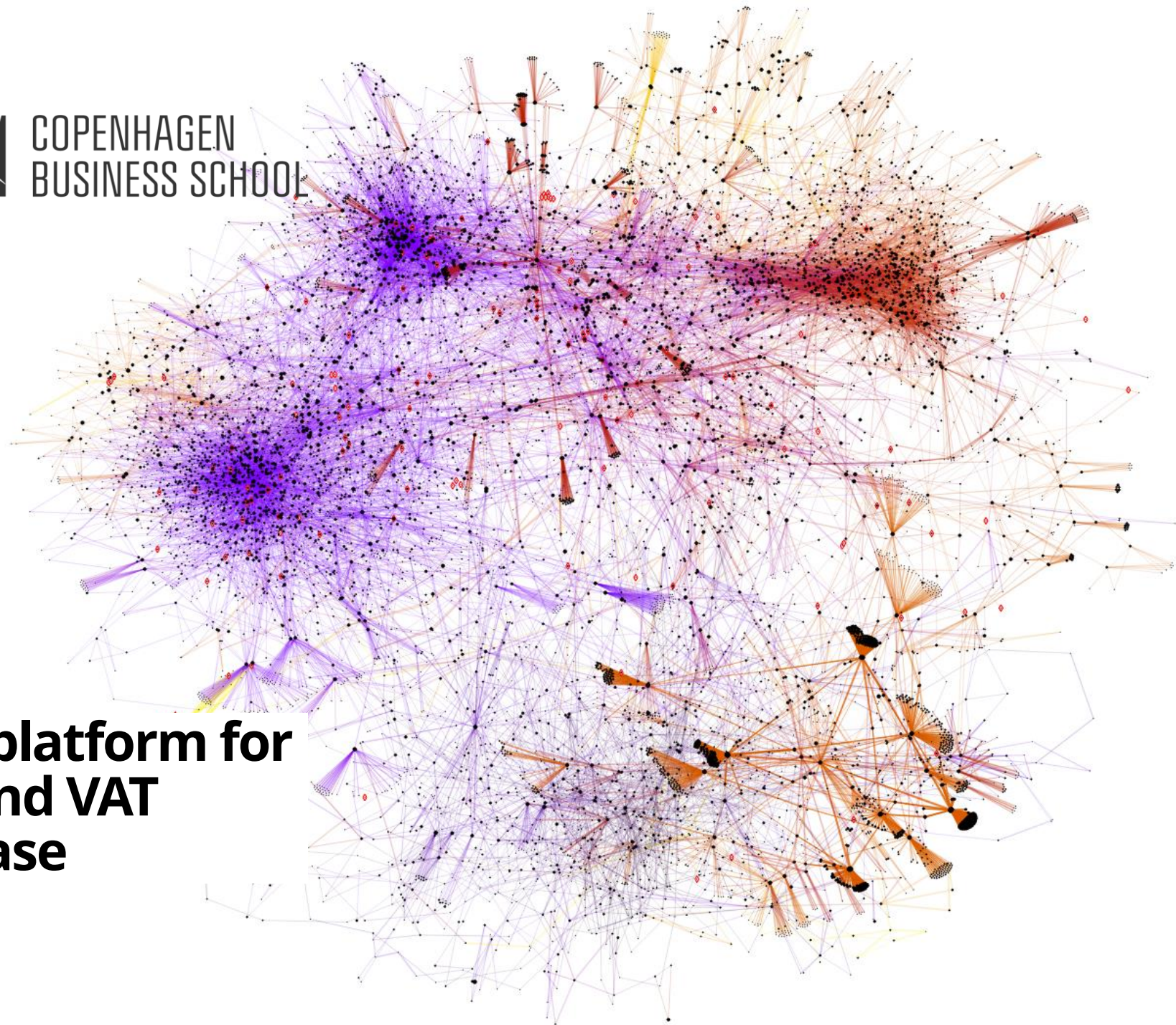


**Deloitte.**  
N3x7G3n

**CBS**



COPENHAGEN  
BUSINESS SCHOOL



44<sup>TH</sup> WCARS, SEVILLE

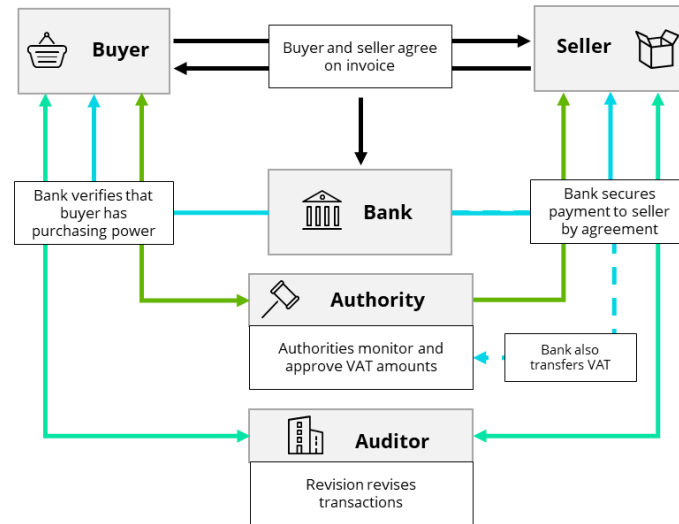
# Blockchain-enabled platform for financial reporting and VAT settlement – A use case

Jonas Sveistrup Søgaaard, Ph.D. fellow & Manager

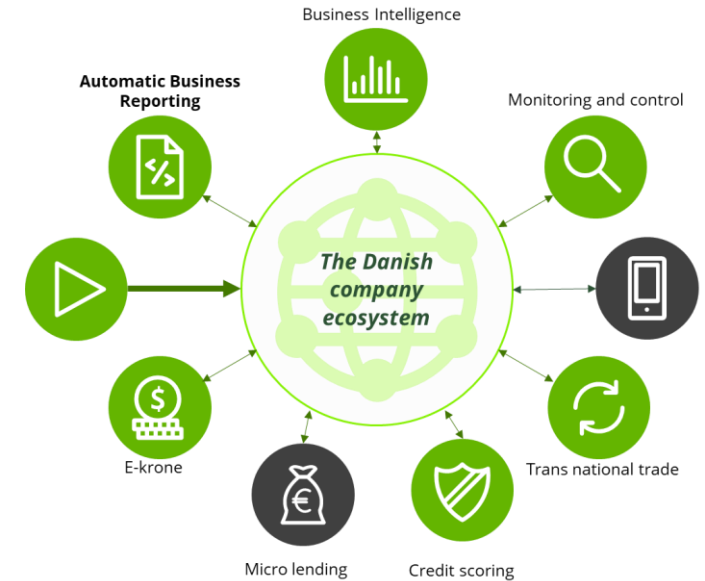
# 1. Setting the scene



# 2. The project



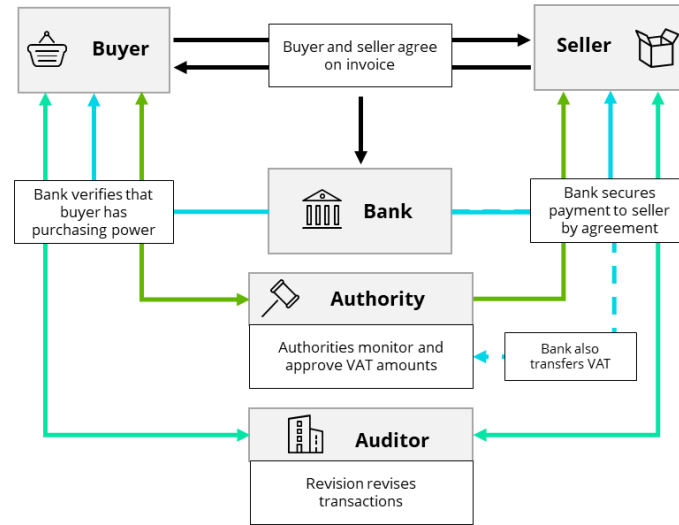
# 3. Further research



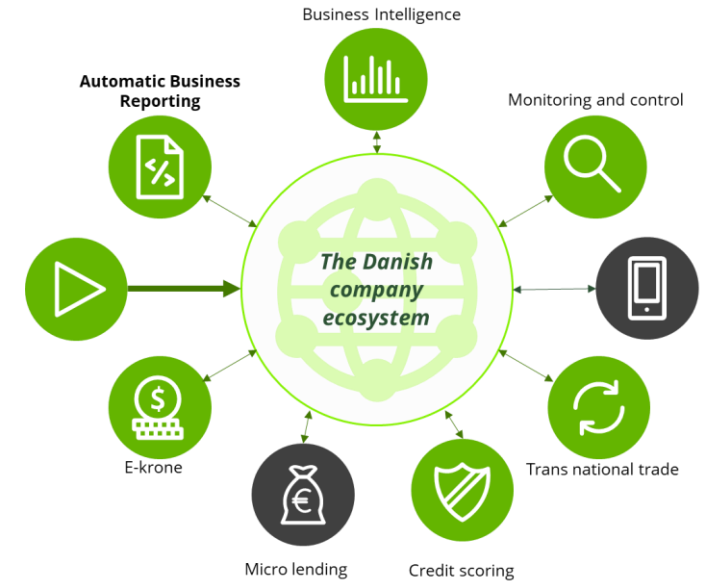
# 1. Setting the scene



# 2. The project



# 3. Further research





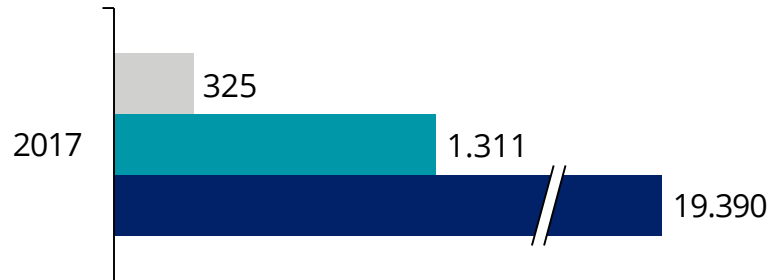
# Lowering the burdens for Danish companies

The Danish Business Authority leads the initiative “Automatic Business Reporting” with focus on lowering the burdens on Danish companies while also increasing productivity and competitive edge.

## Denmark is the most digitized country in world

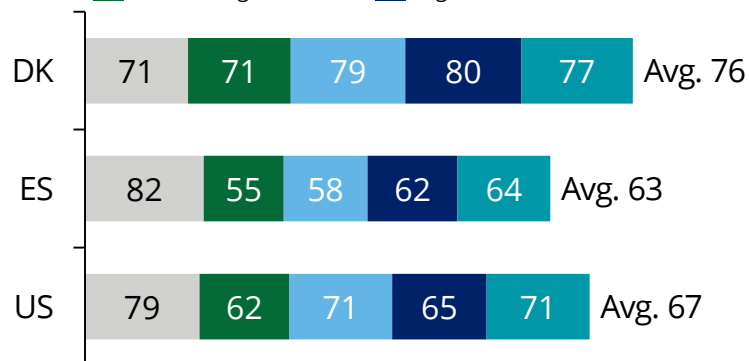
GPD per country, mUSD

DK ES US



I-DESI Index, 2018

Digital public services Internetusage Connectivity  
Business digitalization Digital skills



## Danish Business Authority’s vision is to create the best conditions for growth

The Danish Business Authority has the power to implement and enforce legislation upon Danish companies.

### Vision

To create the best conditions for growth in Europe.

### Mission

In partnership with others we make it easy to attractive run a business in Denmark.

Easy meaning that rules and regulations are understandable, **easy to administer for the businesses**, and that all communication with our customers is **done digitally and in an effective manner**.

## “Automatic Business Reporting” aims to reduce administrative burdens

The DBA drives the cross institutional initiative “*Automatically business reporting*” (ABR) which aims at **automating “annual reports, other financial reporting, and financial accounting statistics”**.

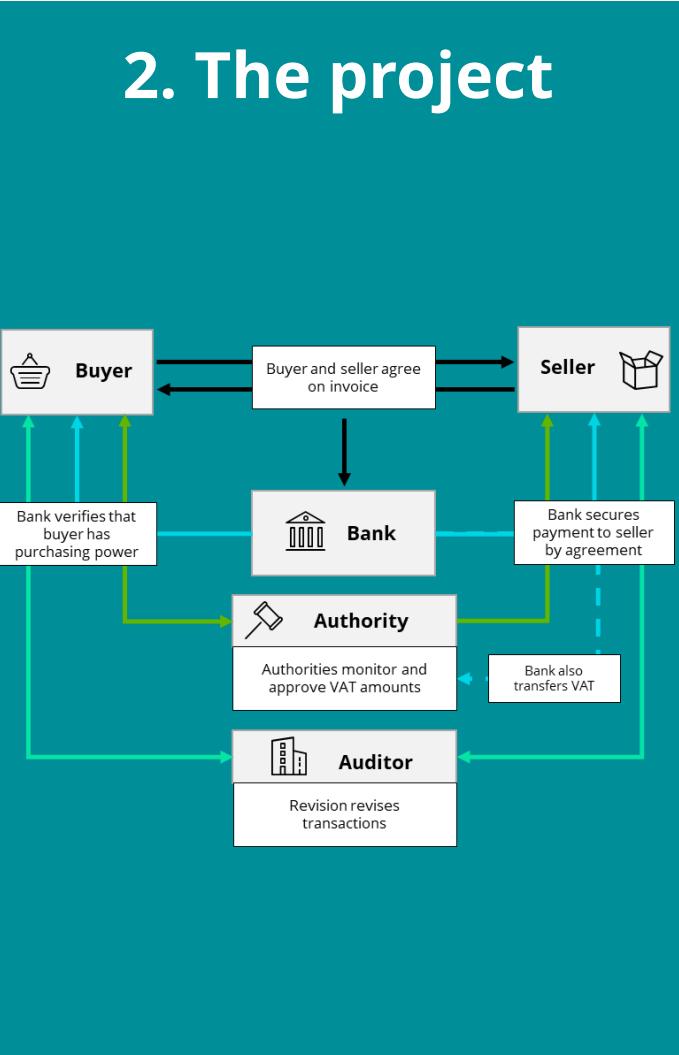
The over all aim is to reduce the administrative burdens of the ~300.000 companies in Denmark

Involved parties:

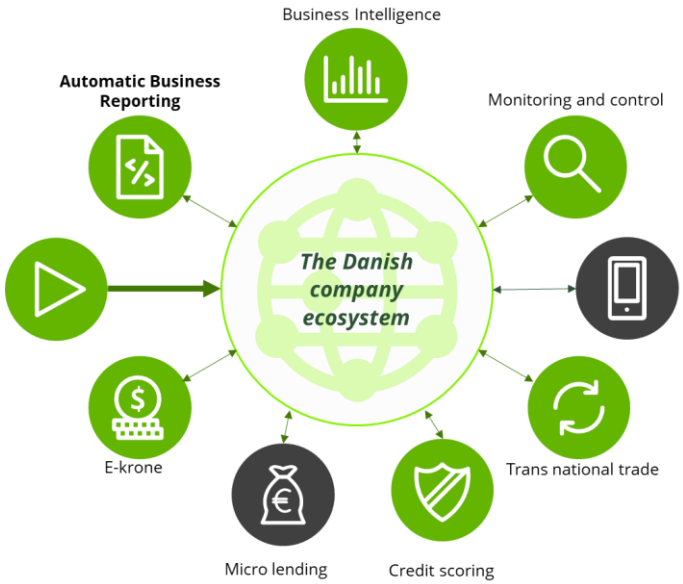
- Danish Business Authority (chair)
- Danish Tax Authority
- Agency for Digitalization
- Statistics Denmark



# 1. Setting the scene



# 3. Further research



# We found that DLT is fit for VAT settlement

By using Design Science Research (Hevner et al., 2004), we developed an IT artefact on Microsoft Azure Workbench with an Ethereum Parity implementation that proved it possible to let a Smart Contract hold VAT of invoices.

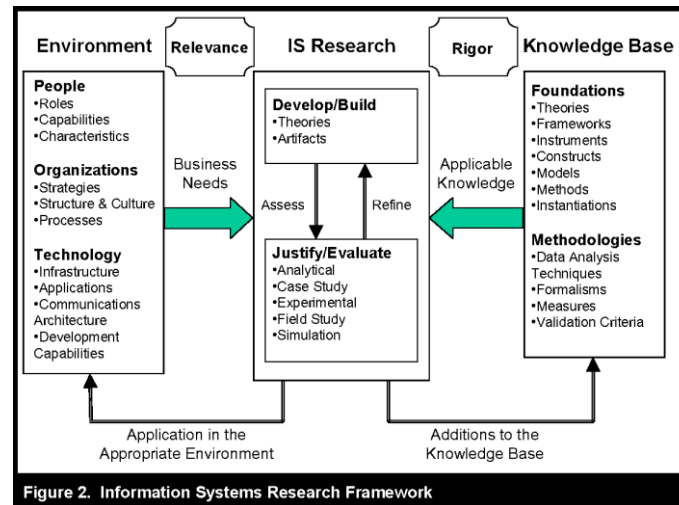


## Research question

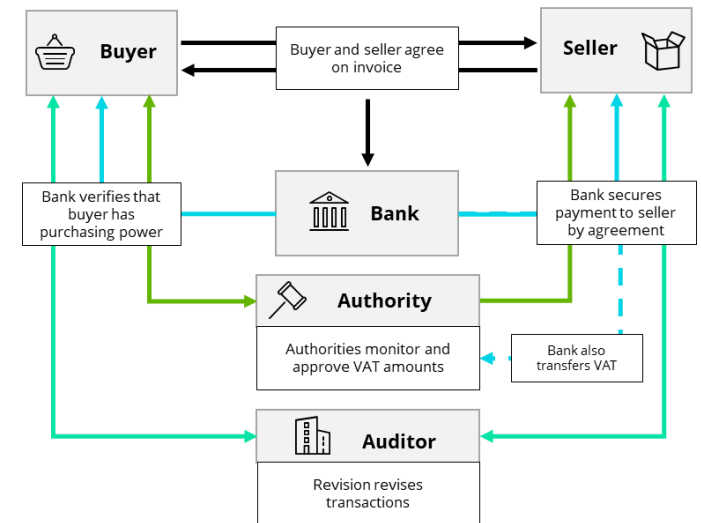
*How can a DLT-enabled IT artifact be designed for **financial reporting automation and VAT settlement** with a specific focus on an open-book invoicing platform offered by the Danish Business Authority to trading partners in the SME segment?*



## Methodology

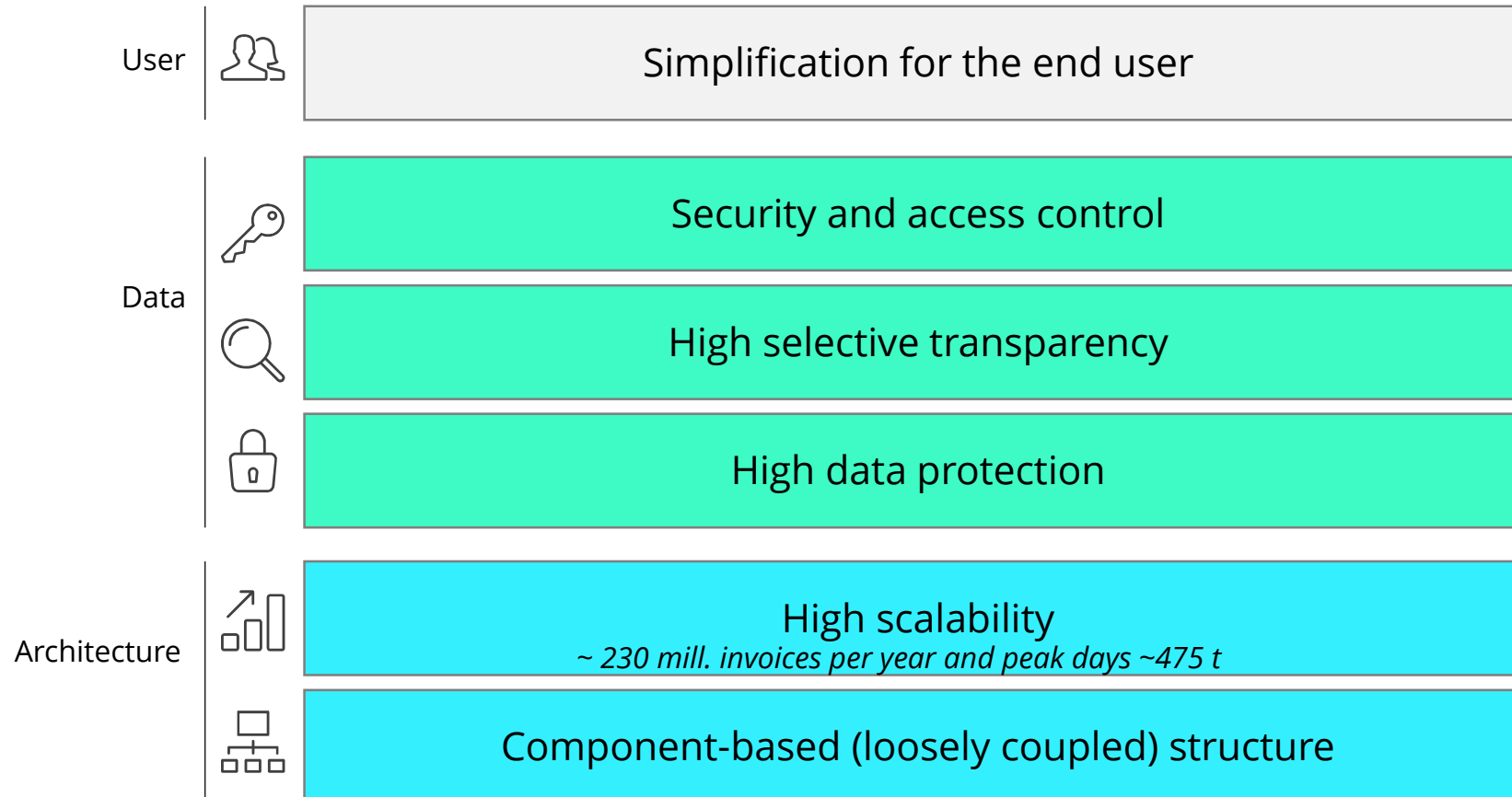


## Contribution



# Design principles as a foundation

Six design principles have guided the project team from the selection of the use case to the choice of technology platform as well as through the design and development activities in the PoC process.

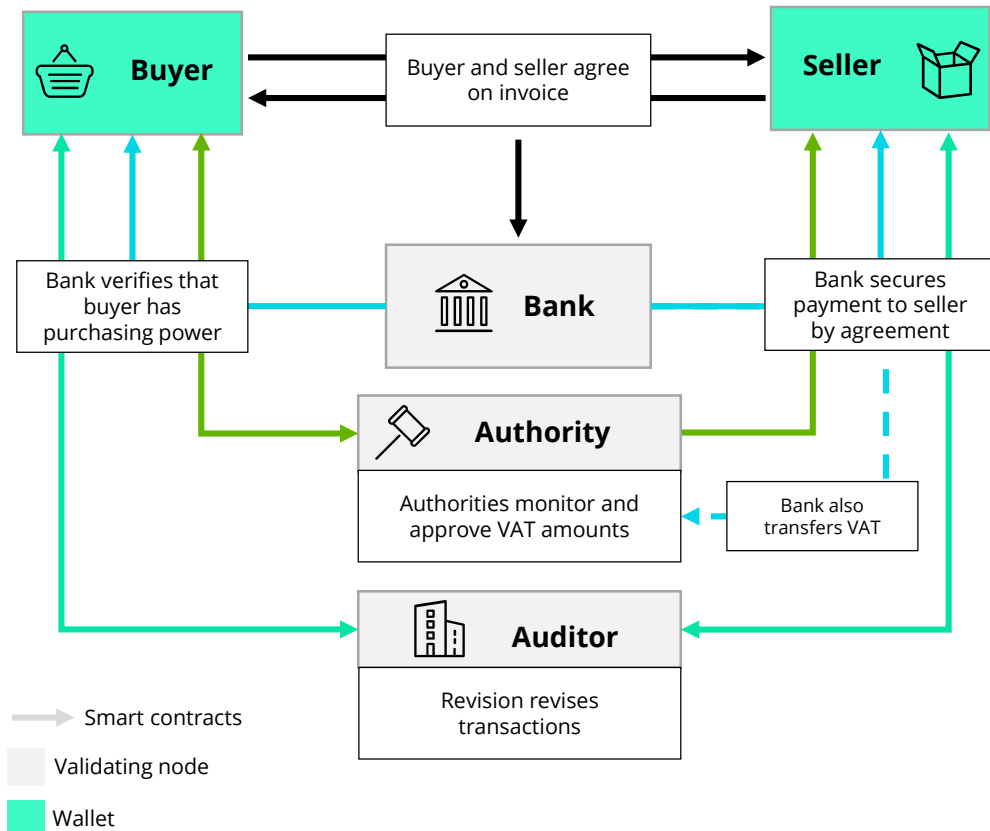




# The artefact optimizes the invoicing process

Two-way invoice authentication ensures tuned transaction base, minimizes VAT fraud and creates common truth. It builds on ontology from McCarthy, Blums, Weigand and Kruijff, VAT from Ainsworth & Hyvärinen, and Blockchain and Continuous reporting literature from Wang, Rozario, Zhang, and Dai.

## Architecture of permissioned DLT



## Platform value and assumptions

- Two-way invoice authentication ensures tuned transaction base, minimizes VAT fraud and creates common truth
- Every company is identified with national electronic ID (NemID)
- Exploiting the existing e-Invoicing standard Denmark has had since 2004 by law and PSD2 for bank information

## Theoretically nexus

- **Ontology**  
McCarthy, 1982; Blums, 2016-2018; Weigand, 2018; Kruijff, 2017
- **VAT**  
Ainsworth, 2016; Hyvärinen, 2017
- **Blockchain and Continuous reporting**  
Wang, 2018; Rozario, 2018; Zhang, 2017; Dai, 2016-17

Receive/ send invoice	Accept Invoice	Make payment	Monitor
x			

# Artefact built on Azure Blockchain Workbench

Adding invoicing to the platform

The screenshot shows a web application interface for 'D-Fakturering'. On the left, there is a sidebar with a '+ New Contract' button and a table of existing contracts. The main area displays a 'New Contract' form with the following fields: 'Modtager', 'Modtagers bank', 'Revisor', 'Filsti', 'Pris ex. moms', and 'Moms'. Each of these six fields is highlighted with a green rectangular border. At the bottom of the form are 'Create' and 'Cancel' buttons. The interface is titled 'Applications > D-Fakturering'.

**Receiver**

The recipient is the company that is to receive the invoice, and can, for example, be found using a CVR number. In this PoC, however, you must refer directly to a user.

**Receiver's bank**

The receiver's bank would automatically show in a production solution, but in this PoC it must be specified for the example's sake.

**Auditor**

Here the seller can add his auditor so that later point in time, he can gain access to an overview of the company's transactions in connection with the preparation of the financial statements.

**File Path**

Specifies the location of the invoice on the user's device.

**Price excluding VAT**

The price of the work done, excluding VAT, is entered here by the seller.

**VAT**

Here is the enter VAT, but can otherwise be calculated automatically based on the price.

Receive/ send invoice	Accept Invoice	Make payment	Monitor
			> x

## 2. THE PROJECT

# Artefact built on Azure Blockchain Workbench

This report has been prepared in Microsoft Power BI and shows a bid on how an authority such as SKAT could follow the number of transactions and VAT reports. The Danish Business Authority will be able to monitor the platform, etc.

SKAT Overblik



There are two starting points for the authorities' monitoring on the platform:

### Monitoring of taxes and charges

Here, authorities like SKAT have insight into the number of VAT transactions and their value over a given period of time. The idea is that this data can be used to more easily spot fraud and abuse, as data can be read completely at company level.







### Monitoring the use of the platform

Here, the use of the platform is visualized. It is possible to see here:

- The number of invoices sent on the platform in a given period
- The response rate (how many issued invoices are answered?)
- Corrections (how many invoices are renegotiated?).

This gives the authorities direct insight into the companies' transactions and in who both uses and does not use the platform.

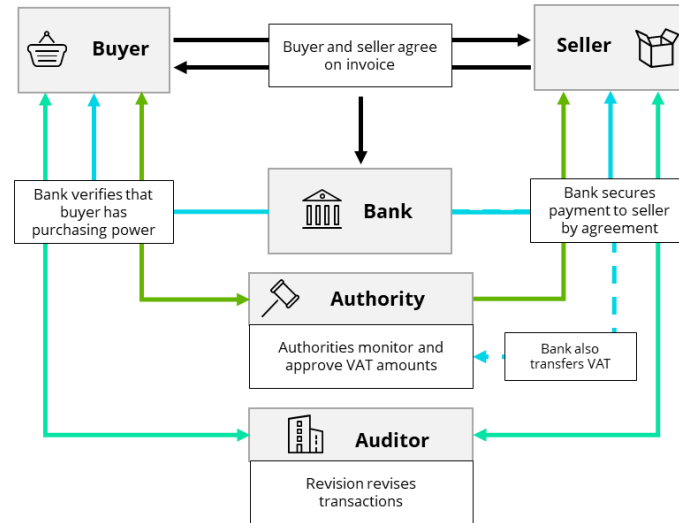
# Evaluation of design principles as a foundation

Design principles		Evaluation
User	 Simplification for the end user	Part of ERP
Data	 Security and access control	Missing NemID & PEPPOL
	 High selective transparency	On chain vs. off chain
	 High data protection	Missing ZKP
Architecture	 High scalability	Not stable enough
	 Component-based (loosely coupled) structure	Very mature

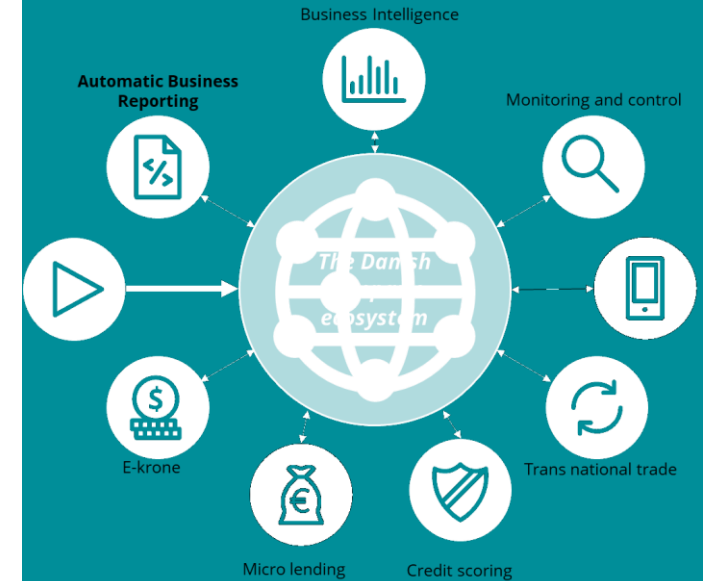
# 1. Setting the scene

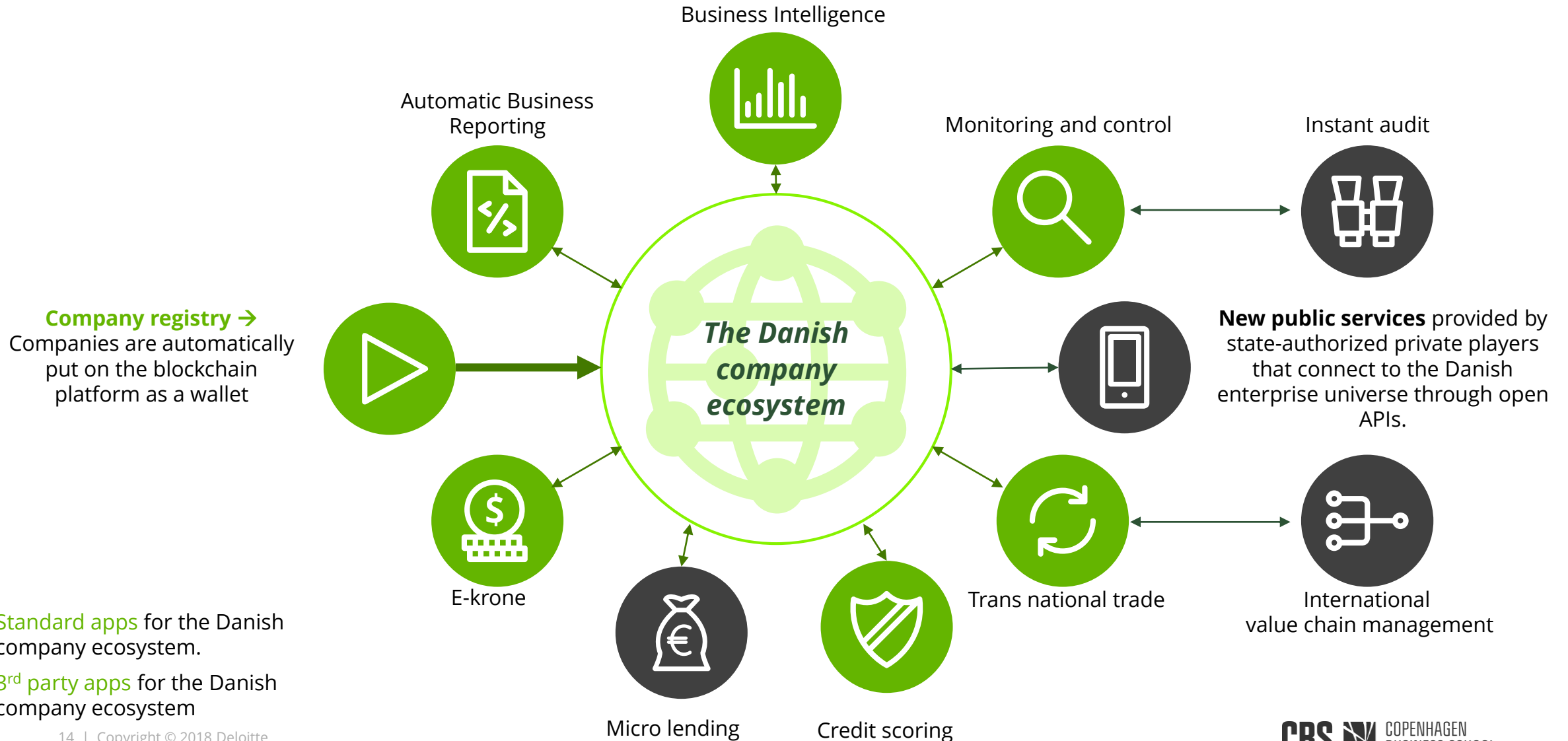


# 2. The project



# 3. Further research







# 1. Setting the scene

**1. SETTING THE SCENE**

## Lowering the burdens for Danish companies

The Danish Business Authority leads the initiative 'Automatic Business Reporting' with focus on lowering the burdens on Danish companies while also increasing productivity and competitive edge.

**Denmark is the most digitized country in the world**  
 The Danish Business Authority's vision is to create the best conditions for growth. The DBA drives the cross-institutional initiative 'Automatically business reporting' (ABR) which aims at automating 'annual reports, other financial reporting, and financial accounting statistics'.

**Automatic Business Reporting aims to reduce administrative burdens**  
 The Danish Business Authority has the power to implement and enforce legislation upon Danish companies.

# 2. The project

**2. THE PROJECT**

## We found that DLT is fit for VAT settlement

By using Design Science Research (DSR) we developed an IT artifact on Microsoft Azure Blockchain with a Liberoam Party implementation. But proved it possible to be a Smart Contract based VAT of invoices.

Research question | Methodology | Contribution

**2. THE PROJECT**

## Design principles as a foundation

As design principles have guided the project, learn from the selection of the use case to the choice of technology platform as well as through the design and development activities in the POC process.

User | Simplification for the end user

**2. THE PROJECT**

## The artefact optimizes the invoicing process

Two-way invoice authentication ensures lower transaction costs, minimizes VAT fraud and creates common basis. It builds on knowledge from McCarthy, Blum, Wegland and Krugl, VAT from Anselworth & Hyalinen, and Blockchain and Continuous reporting literature from Wang, Ruzic, Zhang, and Dai.

High level platform architecture | Platform value and assumptions

- Two-way invoice authentication ensures lower transaction costs, minimizes VAT fraud and creates common basis.

**2. THE PROJECT**

## Artefact built on Azure Blockchain Workbench

Adding invoicing to the platform.

**2. THE PROJECT**

## Artefact built on Azure Blockchain Workbench

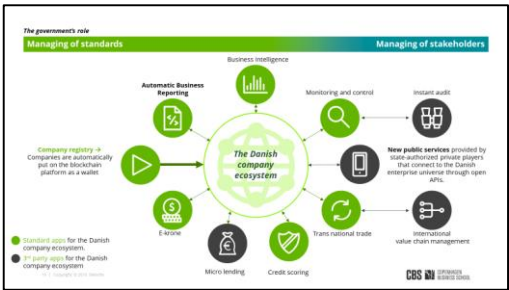
This report has been prepared in Microsoft Power BI and shows a bit on how an authority such as SAG could follow the number of transactions and VAT reports. The Danish Business Authority will be able to monitor the platform, etc.

**2. THE PROJECT**

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# 3. Further research



# Thank you.

**Jonas Sveistrup Søgaard**

Manager – Industrial PhD

**Contact:** [jsveistrup@deloitte.dk](mailto:jsveistrup@deloitte.dk) or [jss.acc@cbs.dk](mailto:jss.acc@cbs.dk)

## Eminence

Electronista 19/9 2018



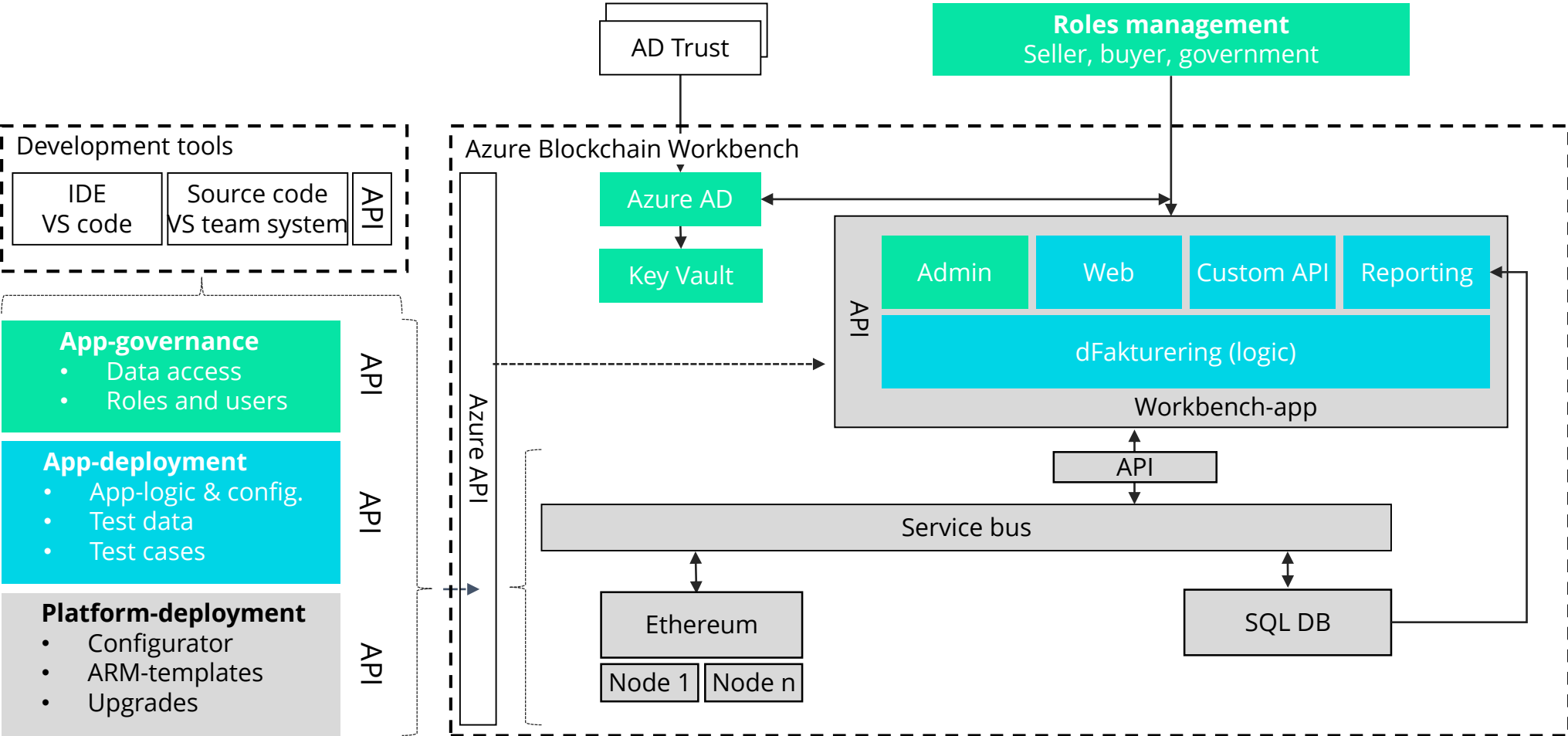
Block21 – Episode 6 & 7



LinkedIn articles



# Architecture and component overview



# A fundamental shift in reporting paradigms

Traditional reporting methods will evolve as the understanding of the possibilities is shaped by the introduction of new technologies, including blockchain.

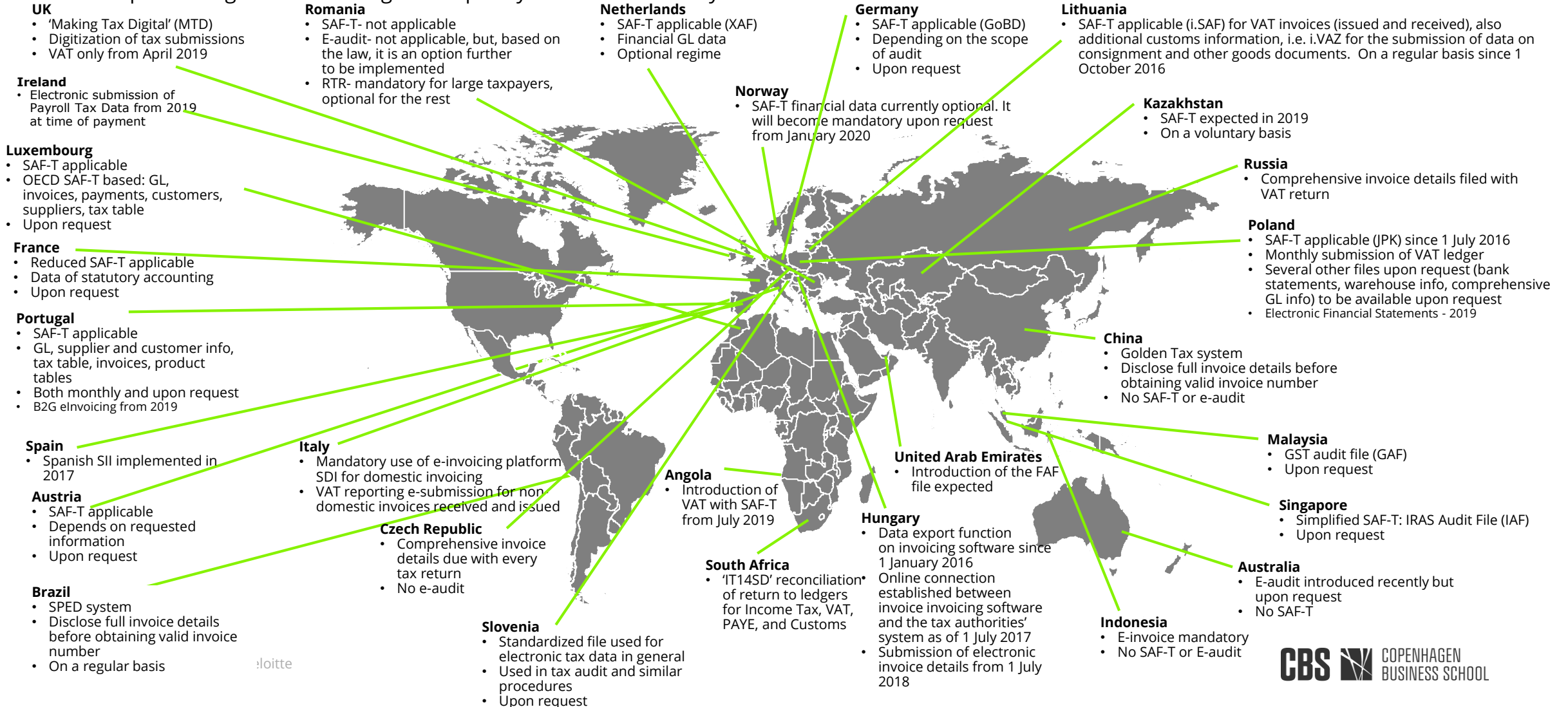
## Current paradigm

## The paradigm of the future

Standalone times and "snapshots"	→	Real-time data
Individual inspections	→	Ongoing insight
Retrospective	→	Instantly and predictively
Sample-based analysis of transactions	→	Analyzes of all transactions
Asset Oriented Accounting	→	Transaction-based accounting policies
One-way communication	→	Multi-Directional Communication
Sporadic investigation of fraud	→	System Supported Identification of Fraud

# SAF-T & other, real-time reporting overview

While not exhaustive, the following map highlights key country requirements for SAF-T, e-audit and real-time reporting requirements, particularly within Europe. New legislation is coming out frequently which reflects the dynamic nature of this area.



# Deloitte Global Blockchain community

World leader in innovation & strategy consulting



## 1 Innovation and Ideation

- We identify relevant use cases to harvest the benefits of Blockchain technologies
- Our thought leadership, developed in conjunction with our ecosystem of innovation and Blockchain companies, enables you to make sense of the broad innovation landscape
- We track over 200 Blockchain companies
- In 2018 the Dutch office opened their 'Blockchain center of Expertise' connecting all areas of expertise within the firm

## 2 Strategy Development

- We lead you to define "where to play and how to win"
- We drive business, technology, integration and talent strategy
- We develop strategies to pilot and implement Blockchain based solutions
- We define an iterative and flexible approach to match the rapid changes in the ecosystem

## 4 Product Development

- We mobilize our global practitioners to your organization to re-engineer business processes or design new ones
- We bring our broad set of services, across compliance, technology, talent, operations and tax, to effectively integrate your Blockchain solution
- We deliver as one team in collaboration with external companies

## 3 Prototyping

- We accelerate prototyping by using our existing technology capabilities and industry experience
- We have prototypes up and running: Digital Bank, Loyalty & Rewards and Smart Identity
- We have over 35 prototypes in development

23

Industries where we have deep business process knowledge



Global delivery network with 9 development teams – having delivered 35+ blockchain prototypes\*

1,600+

Practitioners in our Blockchain community from 40 countries



Selected ecosystem alliances with technology and innovation





# Introduction to Deloitte's blockchain practice

Recognized as a global leader in digital and innovation consulting by ALM, Forrester and IDC and awarded by Central Banks for our work with blockchain

## Thought Leaders / Innovators

Groups or organisations that help innovate, ideate, and incubate to support Blockchain innovation



Think tank that offers educational programmes and a business incubator



Non-profit creating partnerships with global business and intellectual leaders



World's leading trade association for digital assets & Blockchain industry



Irish research university with a depth of expertise within distributed ledger technology



Research lab skilled in providing links between research areas to innovate business solutions



Trading firm specialized in digital currencies



Italy's largest technical university with a particular emphasis on Blockchain



FinTech incubator, venture fund and corporate innovation consultancy



Silicon Valley think tank that offers educational programs and a business incubator.

## Collaborators

Vendors working within the Blockchain space with whom we have teaming agreements



Global bitcoin payment service



Bitcoin wallet



FinTech company



Bitcoin wallet



DLT company and consortium leader



IT company supporting workflow digitization



Blockchain platform



Digital asset exchange company



SaaS company with a digital currency exchange platform



Provides an API to build applications on the Blockchain



Open source blockchain project



Open source Blockchain platform



Blockchain infrastructure provider



Digital identify provider



Identity verification and protection



Blockchain cybersecurity start-up



Scalable Blockchain database



Blockchain-based data storage



Open source Blockchain platform



Open source collaborative Blockchain effort



Blockchain currency exchange



Blockchain infrastructure



Private Blockchain platform

## Platforms

Alliances with Blockchain platforms that we have built prototypes upon and investigated further



Real-time payment protocol



Open Blockchain platform



Cloud-optimized Blockchain platform



Smart contracts platform



Global enterprise Blockchain solution provider



Blockchain-based loyalty & rewards platform



Decentralized Blockchain app provider



Issuance and trading Blockchain platform provider



FinTech firm specialized in financial Blockchain implementation



Security hardware



Blockchain platform



Financial Blockchain platform



Blockchain interface company



Issuance and trading Blockchain platform provider