ESMT BERLIN

Digitalization in the energy world: the role of big data/ AI, Blockchain and cyber security

Christoph Burger and Jens Weinmann, ESMT Berlin
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About ESMT Berlin

- Founded by 25 leading global companies and institutions
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- Offers a full-time MBA, an executive MBA, a master's in management as well as open enrollment and customized executive education programs

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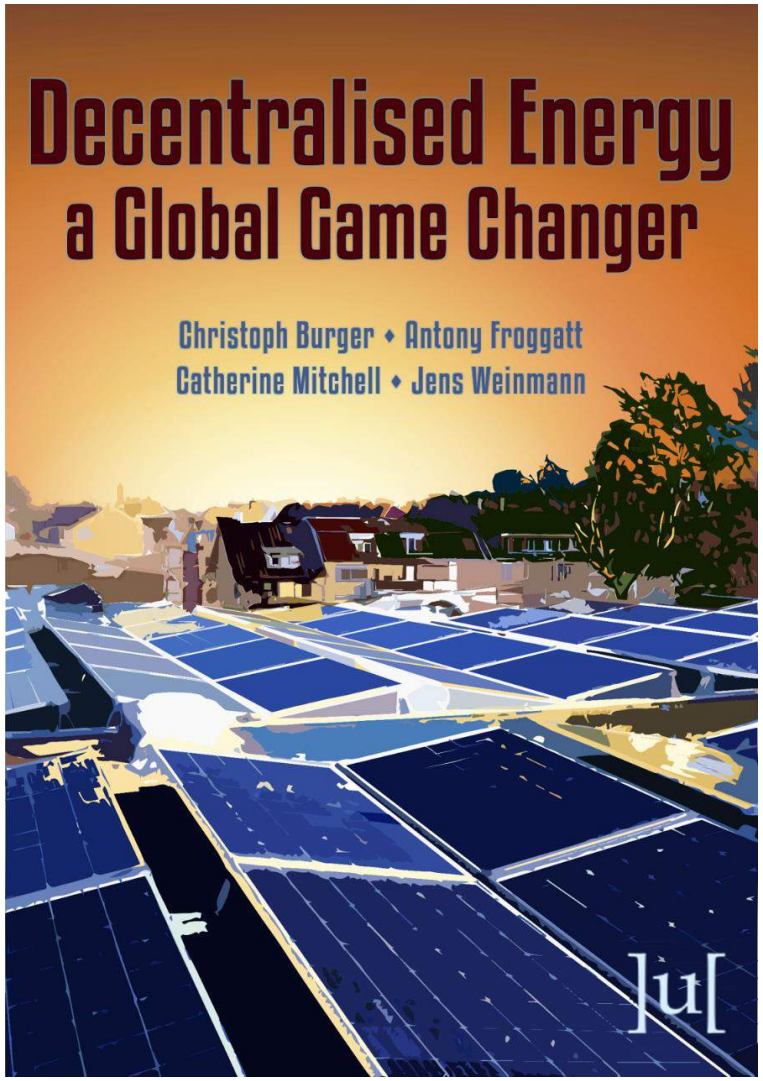
Energy activities focusing on downstream innovation
Upcoming book to analyze governance and business model innovation on a global scale



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2. Regulatory and policy incentives – establishing governance of decentralized energy systems
   Country analysis: Australia, China, Denmark, Germany, India, Italy, California and New York

3. Business models beyond subsidies – which core competencies are needed?
   Case analysis: Envio Systems, Timo Leukefeld, Entelios, SOLshare, Mobisol, Solarkiosk, Power Ledger

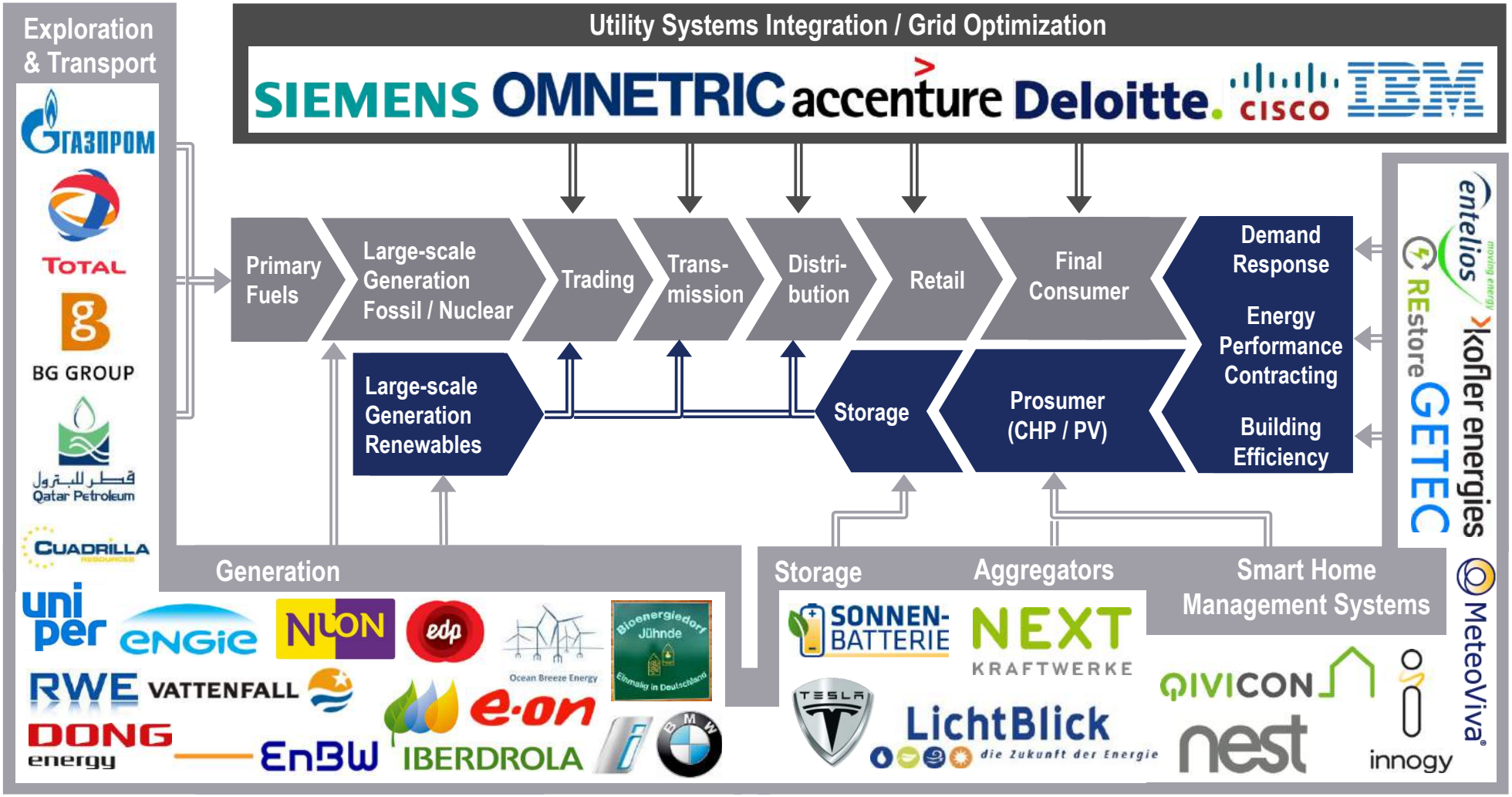
4. The three phases of the energy transformation – top-down and bottom-up

5. Global game changer – leading the future

Agenda

Chapter 1	What drives digitalization in the energy world? – a short teaser
Chapter 2	What is the role of big data/ AI, Blockchain and cyber security? – potential and challenges

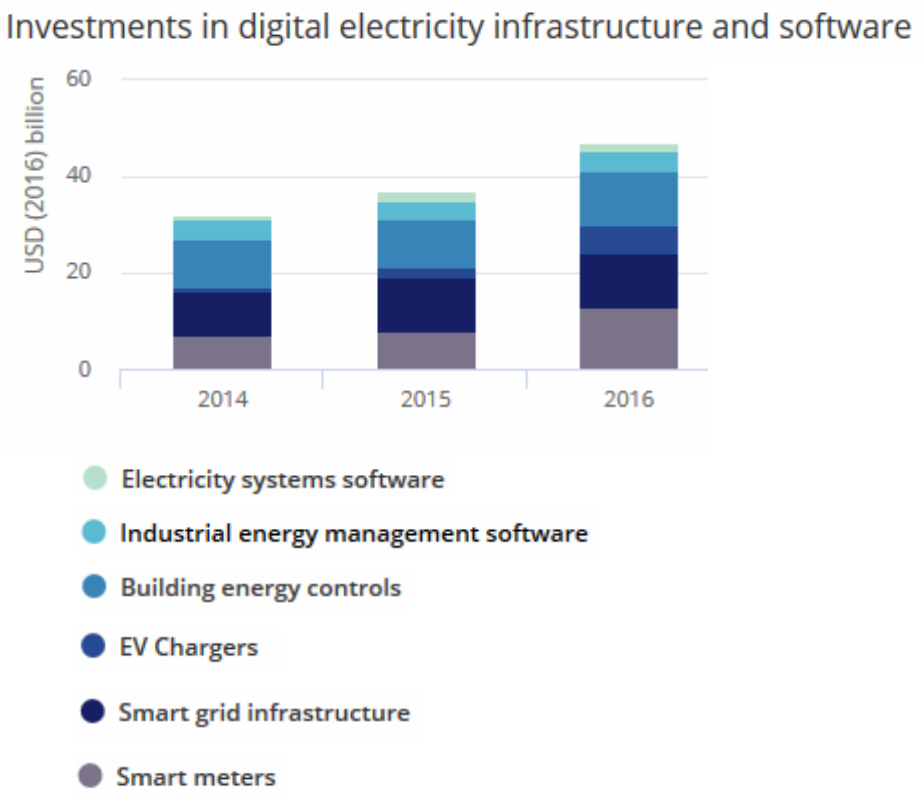
The value chain of the energy business is turned upside down: the case of Germany

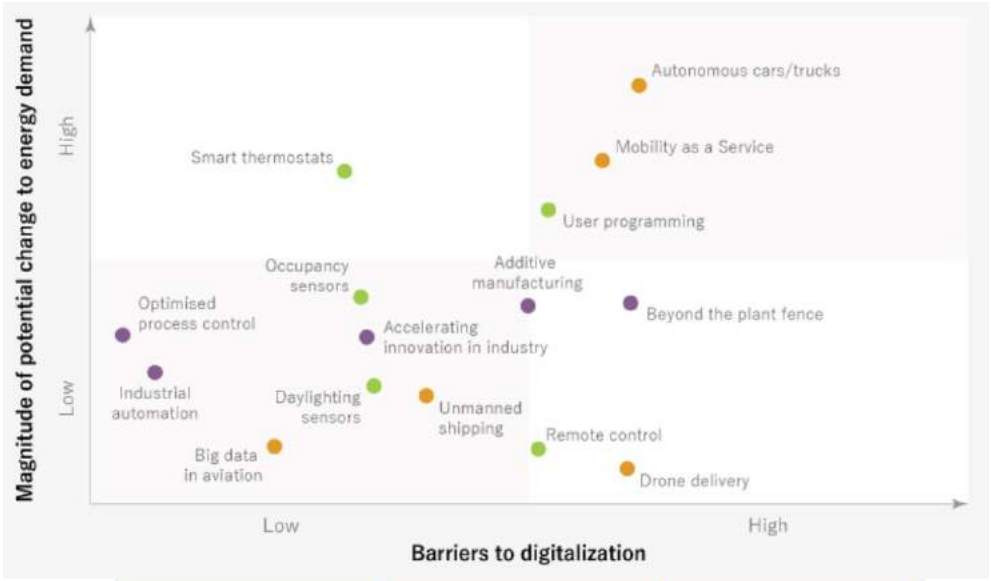


Source: Burger/Weinmann (2014/17)

The revolution is not renewables but the opportunity to produce own energy with increasing complexity for the system and market

Digitalization investments aim to enable better performance, new networks and services in the light of a new energy world





Source: https://www.iea.org/digital/, retrieved on 06.08.2019; Digitalisation in the Energy Sector | Pöyry global

Agenda

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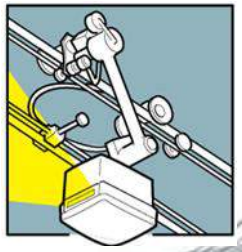
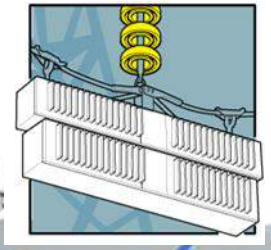
AI is creating opportunities for new service models

Drones and insect-size robots identify defects, predict failures, and inspect assets without interrupting production



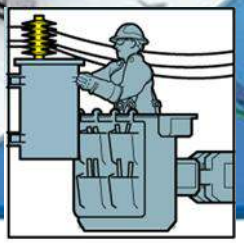


Smart wires combine with machine learning to enable real-time power dispatching, and optimize it to current grid load

Machine learning–enabled forecasting anticipates supply and demand peaks

Virtual agents automate call centers, and automatically segment consumers based on service history; machine learning offers early warning of bad debts

Smart-meter data and machine learning enable utilities to offer services based on usage, weather and other factors



Field workforce receives real-time updates to decrease response times and reduce the impact of outages

Sensors and machine learning allow for by-the-minute adjustments to maximize generation efficiency

Few technicians remain, but they spend more time on problem solving; in place of logging inspection status by hand

Source: McKinsey (2017), image source: 3M Switzerland

Envio Systems is leveraging the Internet of Things for a low-cost alternative for building efficiency …

Hardware: 500 EUR
Smart Climate Controls
Smart Lighting Control
Demand Response
Occupancy Controls
Failure Detection
Weather Predictor

Hosting: 5 EUR per controller per month
Reporting System
LEED and BOMA Best Tracking
Real-time Energy Tracking
Mobile and Email Alerts
Security System

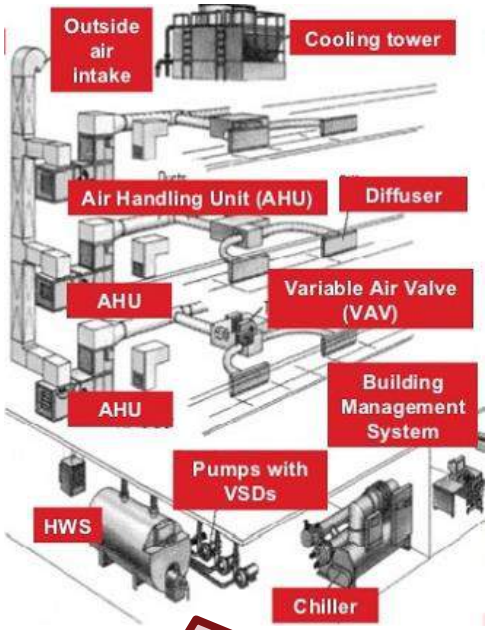
Criteria	envio	Honeywell, etc.
Payback period	1-2 Years $0.60-$0.80 Per Sq./Ft.	6-8 Years $3-$4 Per Sq./Ft.
Installation	60 KEUR	240 KEUR

Source: envio

… while still keeping human control on it

Reza Alaghehband, CEO

envio



1) Device recognition

- Naming conventions of HVAC devices often unclear
- Understand common serial numbers and match them with the category of the device and manufacturer
- Recognize device according to consumption patterns by learning from all the buildings that are part of the Envio database

2) Predictive maintenance

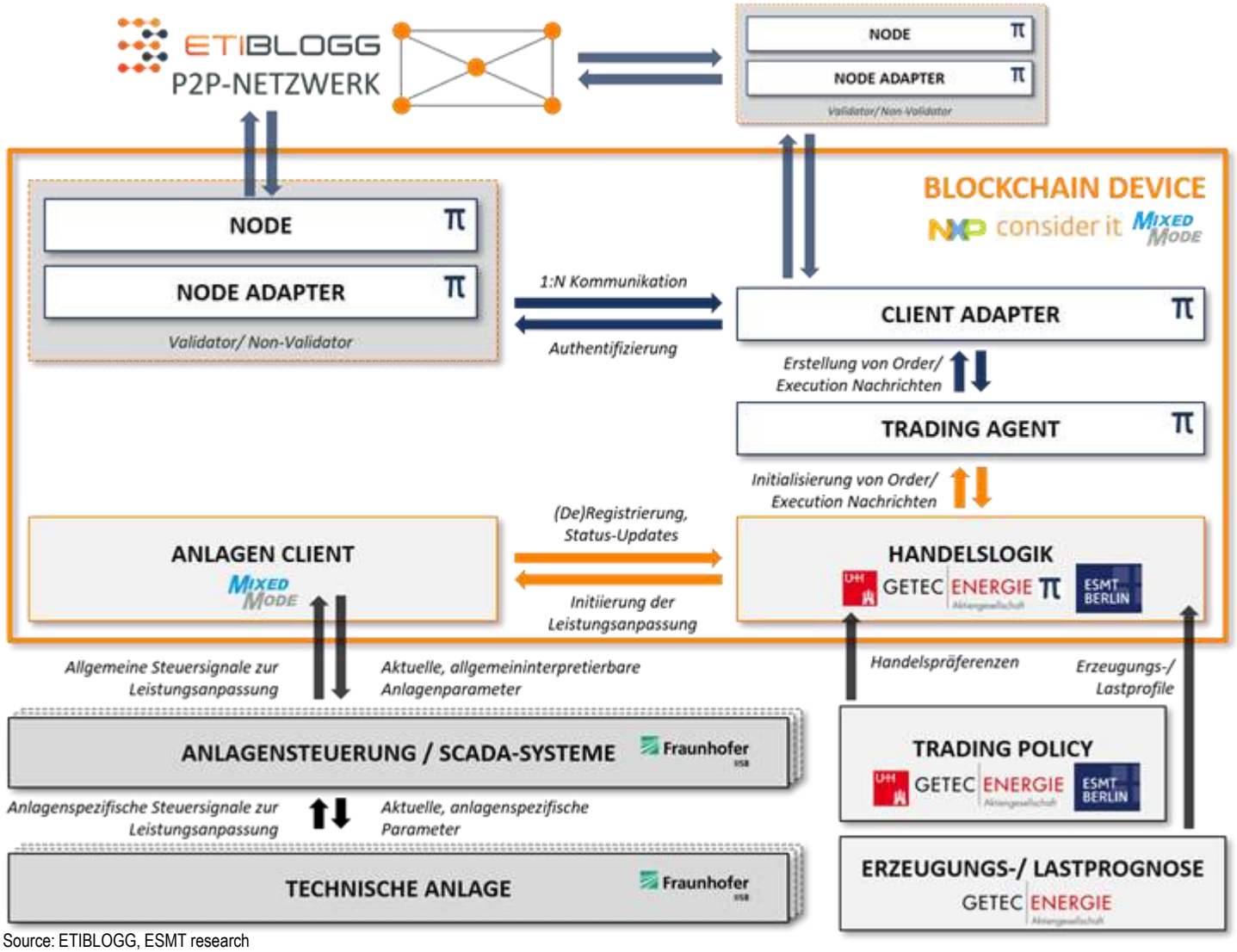
- Train the system to identify potential breakdowns
- Analyze data to recognize patterns (e.g. burst pipe) to trigger preventive actions

"We don't trust it!

We don't put the machine in critical aspects applications
If uncontrolled, it may heat up to 90°F (32°C)!"

Source: Envio Systems (2018), image source: descriptionebooks.com

Blockchain: within the ETIBLOGG (Energy Trading vla Blockchain-Technology in the LOcal Green Grid) project, ESMT is analyzing business models, potential and hurdles



Source: ETIBLOGG, ESMT research

ESMT research questions

- How do business models in energy applications and platforms differ between single providers and consortia?

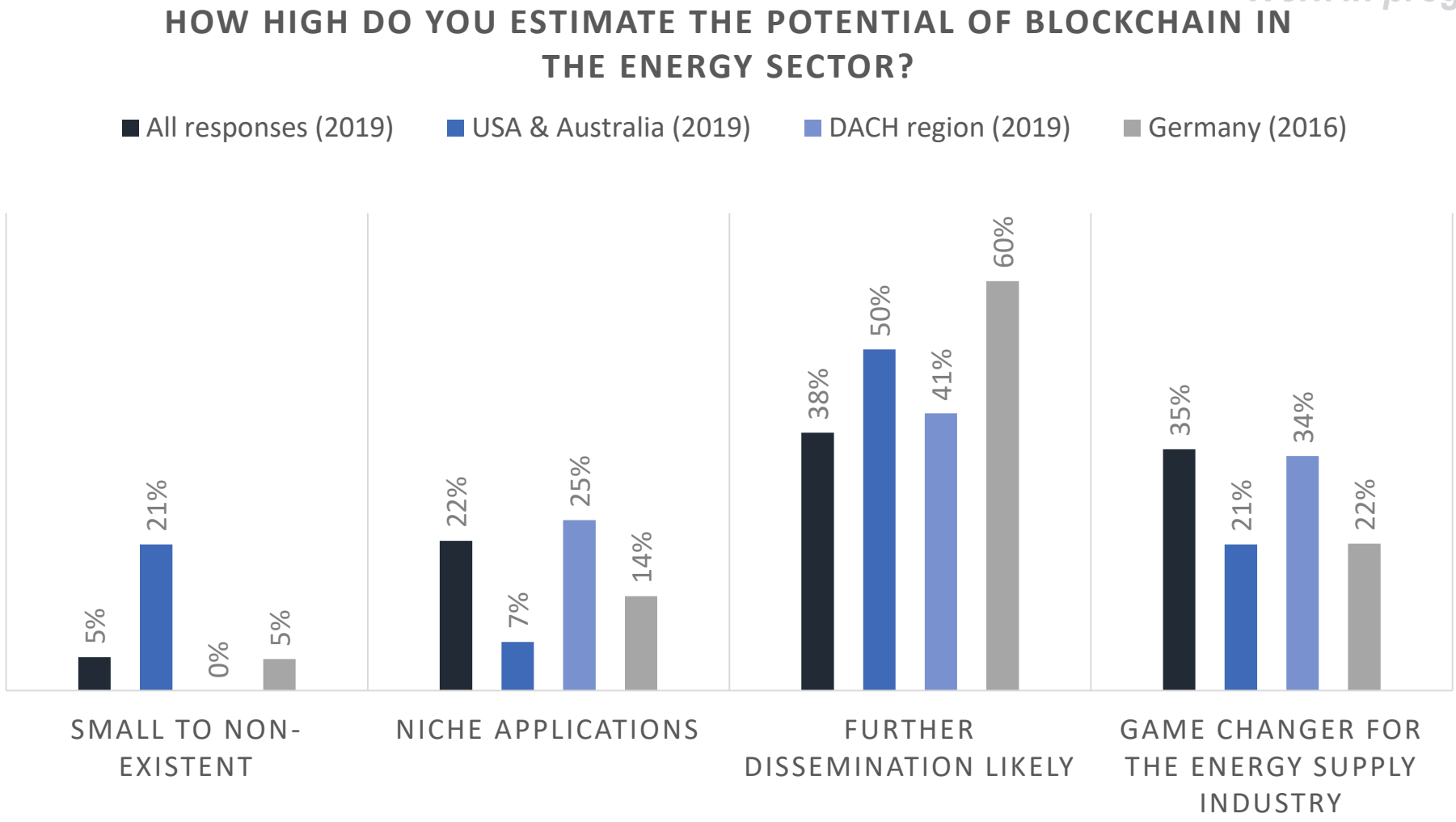
  ⇒ **Qualitative interviews with providers from the energy sector, and non-energy firms, in particular finance/ fintech**

- In which fields do executives see the greatest potential and hurdles for implementing Blockchain solutions in the energy sector?

  ⇒ **Quantitative global survey** among professionals in jobs related to the energy sector

Based on a global survey in 2019 in energy business, more than 70% see Blockchain as a game changer or with further dissemination likely – an enabler of the transformation?

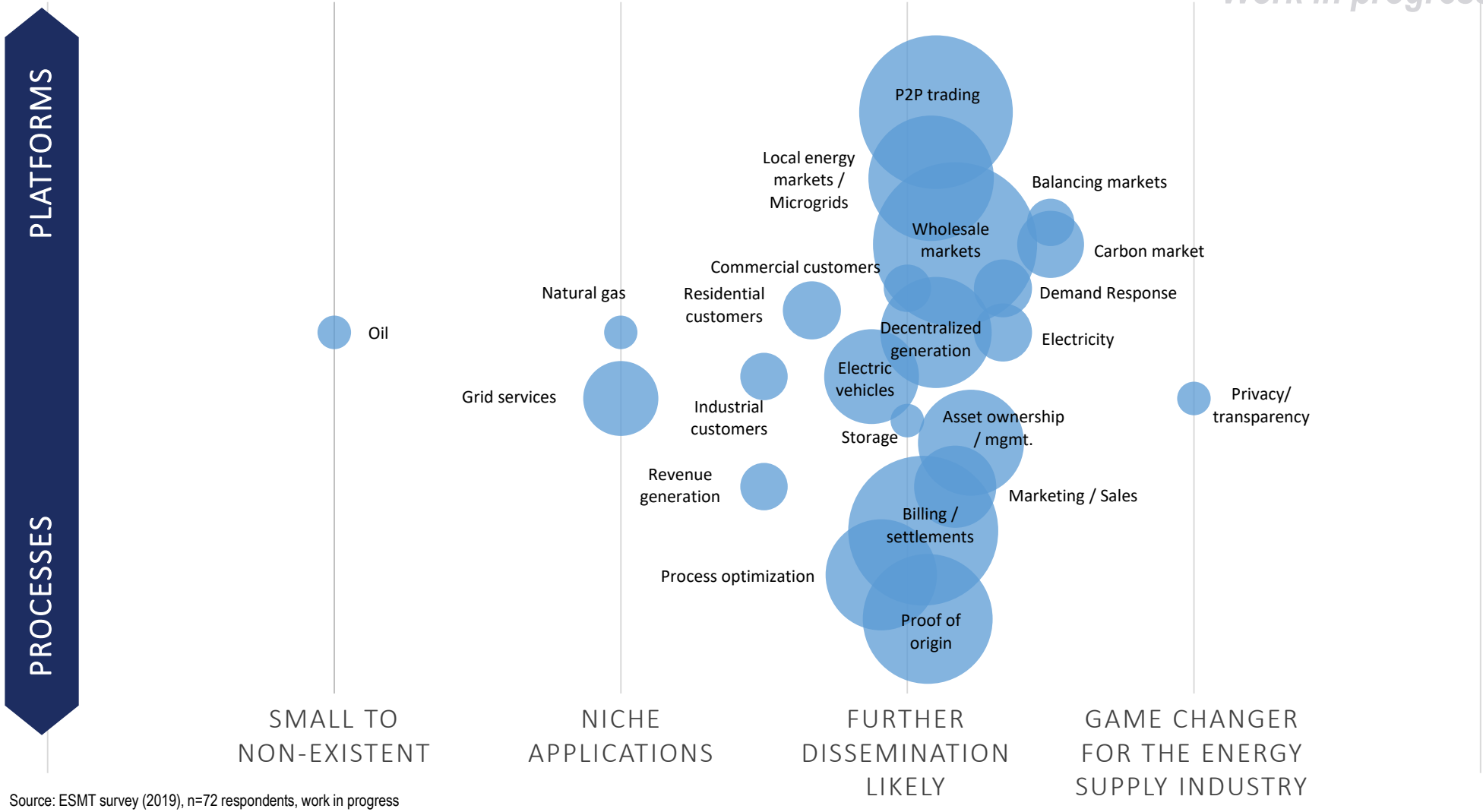
Work in progress



Source: ESMT survey (2019), n=72 respondents, work in progress

The potential of Blockchain within the transformation of energy markets is evenly distributed between platforms/ marketplaces and process optimization

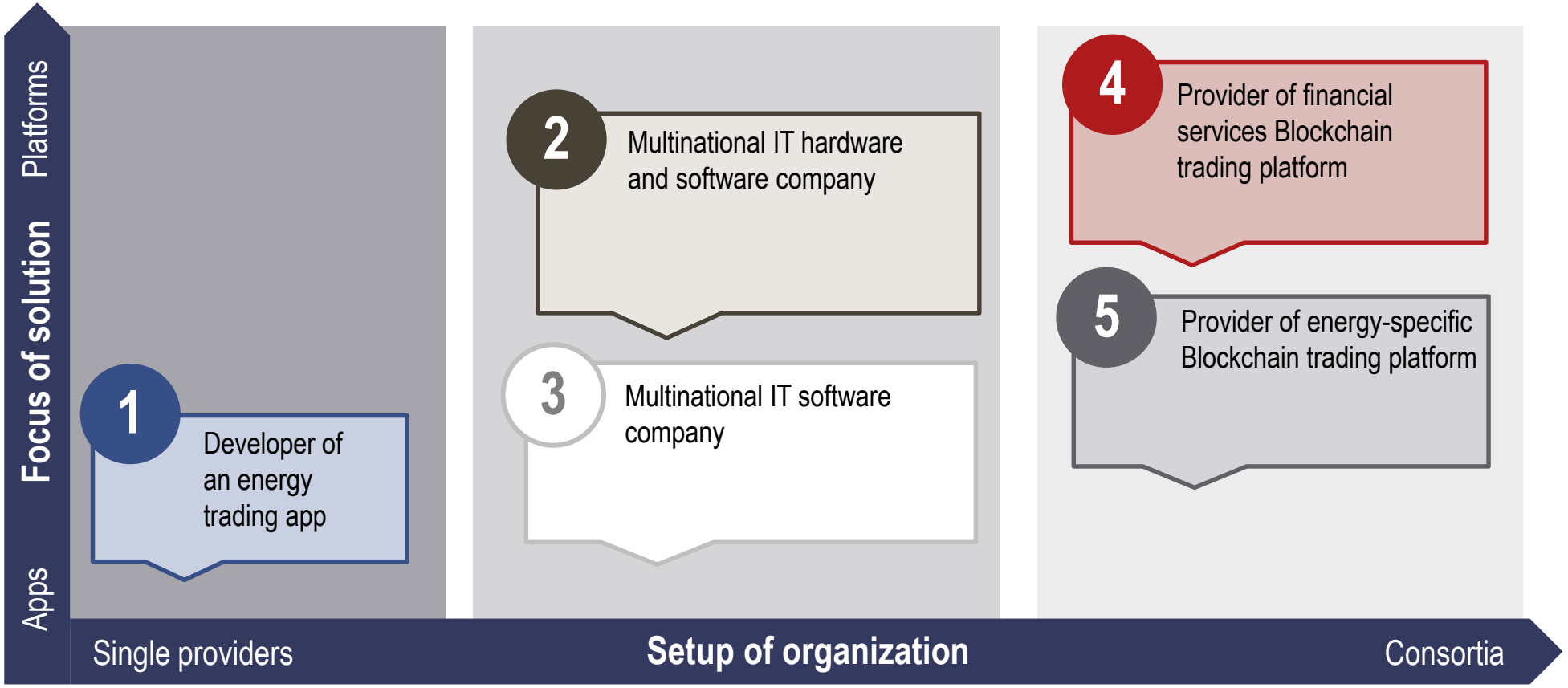
Work in progress



Source: ESMT survey (2019), n=72 respondents, work in progress

Qualitative interviews with key decision-makers in energy-related, financial and multi-sector Blockchain applications were conducted to shed light on the business models pursued

Work in progress



Source: ESMT research, work in progress

1

Developer of an energy trading app

Blockchain used as communication channel with 90% cost reduction and no regulatory hurdles

Work in progress

Value proposition

"It's not just 20% technical optimization, it is **90% cost reduction**, because this organizational cost disappears. Instead, the nodes need to be hosted in the cloud, which - compared to 5 million - is maybe in the range of 5-10,000 Euro."

Blockchain usage

"That is just a **communication channel**. You can compare that with a chat service for example, with the Yahoo Messenger – before it was decommissioned, is been used as a **tool to offer and accept offers between traders**."

Hurdles

" One is a **technical pain point** …If it is a high frequent market, Blockchain won't work for the execution because **we always have a delay**." …

"And the second pain point has absolutely **nothing to do with the technology**. …there have been brokers who attempted to establish a new platform and they all **failed in dragging liquidity** from the existing platforms.." …

"If you have this multilateral trading facility (MTF), which simply said is like an exchange, you have a bunch of **regulatory requirements to fulfill** and that is a very complex situation."

Financing

"Instead of having this foundation approach, we first start this as a service. Market participants will **pay a fee of €500 per month**, including 500 transactions per month. If it goes beyond 500 transactions per month, it will be charged on the basis of additional transactions."

Source: ESMT research, work in progress

2: Permissioned Blockchain IT system
5: Tokenization model with hurdles and upside

2 Multinational IT hardware and software company

5 Provider of energy-specific Blockchain trading platform

Value proposition

"The solutions are categorized in three dimensions. The first dimension is **join**. The second is **coordinate**, and the third is **build**: software as a service, like subscription, you have cloud services, and you have consulting application services."

"We **develop software** for the decentralized network (platform), facilitate meetings, and produce or develop customized software for some of our affiliates, like IT services, or license payments. It's very similar to **Linux Red Hat business model**, on the one side Linux made an open source software, on the other side Red Hat made money with services. So you can consider our organization as a mixture between Linux and Red Hat in one."

Blockchain usage

"In my view, first are the typical value propositions that are addressed and delivered by Blockchain technology; first transparency, second trust; third, speed or acceleration concerning processes; and fourth, a wallet, the security dimension. Therefore **trust, security, speed, acceleration**."

"Our affiliates tend to **use the Blockchain as little as possible**, because it costs money to use the Blockchain. So, usually it's being used for coordination purposes, for access rights, for value transactions, for a recording of provenance, and so forth. But as little as possible. Generally, **coordination of rights or of ownership of assets**."

Hurdles

"We use Hyperledger Fabric, only because we truly believe that it is the only really enterprise-ready technology, it's really important to have technology that is **capable to run these high performance numbers**."

"We have a bigger problem on the **privacy issue**. Where we developed a couple of features around privacy, but of course, it's easier in a private chain."

Financing

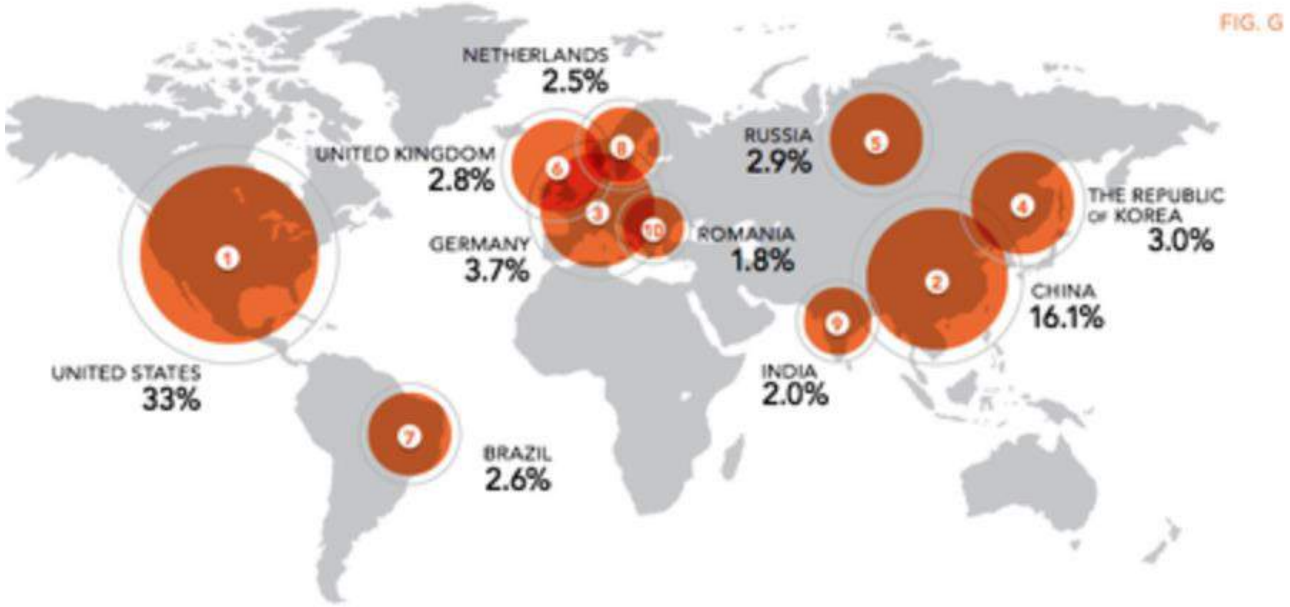
"It's a **heterogeneous approach** with services offerings coming out of different areas within our company, like **consulting, architectural services, software as a service cloud**, and so on, as the solutions are very different."

"Besides fundraising, cash flow. It will be combination of cash flow based business models, which is as I said before, the **Red Hat business model** and a mixture of **token economics**."

Source: ESMT research, work in progress

Cyber security: a study by Alert Logic indicates that 37% of respondents estimate that their firm's sensitive data had been breached in the past 12 months

Sources of cyber attacks

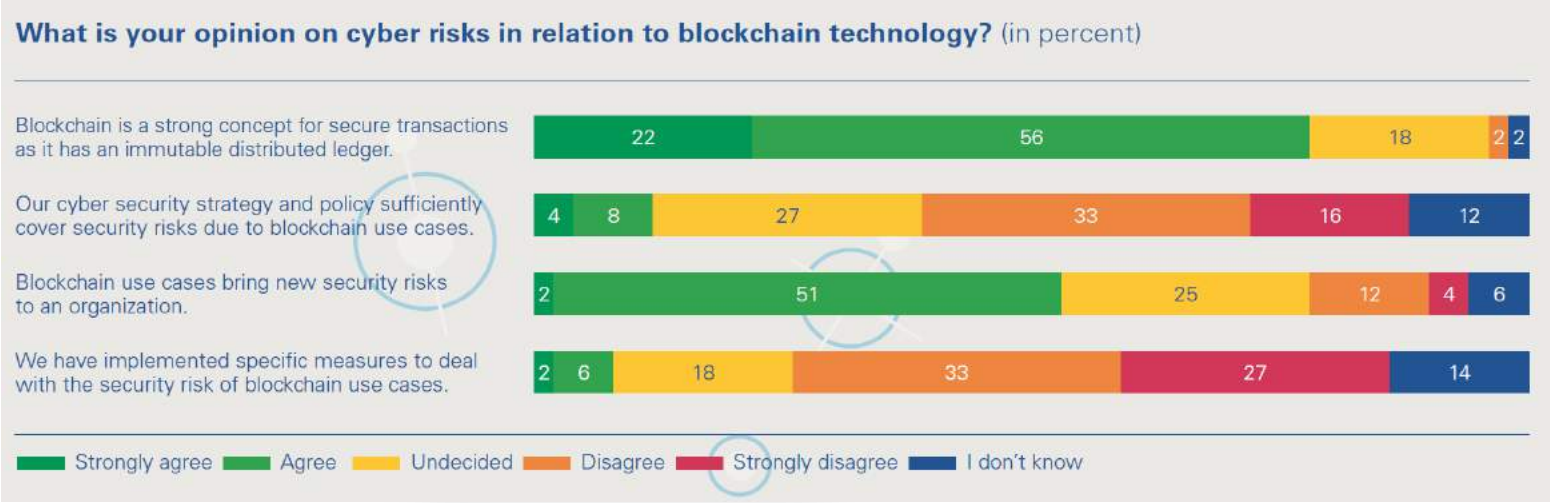


Business models

- Industrial espionage
- Blackmailing
- Influencing (e.g. M&A)

Source: https://www.designnews.com/industrial-machinery/new-age-hackers-are-ditching-smash-and-grab-techniques/28838791746541, retrieved on 06.08.2019

Example smart meter infrastructure: while Blockchain might provide a solution for cyber risks, smart meter infrastructure is specifically vulnerable at the edge



- **Technical failures**
  Antiquated, insecure protocols
- **Institutional/ regulatory failures**
  Cost-driven regulation of distribution grid service operators
- **Organizational failures**
  Insufficient knowledge of distribution grid operators

Source: KPMG, clarity on cyber security (2018), ESMT/ dena (2018)

Summary

Chapter 1

What drives digitalization in the energy world? – a short teaser

- The value chain of the energy business is turned upside down: the case of Germany
- The revolution is not renewables but the opportunity to produce own energy with increasing complexity for the system and market
- Digitalization investments aim to enable better performance, new networks and services in the light of a new energy world

Chapter 2

What is the role of big data/ AI, Blockchain and cyber security? – potential and challenges

- AI is creating opportunities for new service models with providers (e.g. Envio) still controlling it by humans
- Blockchain is seen as a game changer or with further dissemination likely providing process and platform solutions with no hurdles for implementation up to many hurdles when using tokenization
- Cyber security is getting more important while smart meter infrastructure is specifically vulnerable at the edge

thank you

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