EMERGENCE OF DIGITAL AND X-AS-A-SERVICE PLATFORMS IN GERMAN ENERGY SECTOR

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AGENDA

- Research background
- Research question
- Methodology and Data
- Findings
- References



RESEARCH BACKGROUND

- Innovation Systems Data Excellence Center ISDEC, Funded by the Fraunhofer society.
- The sub-project "Data-driven assessment of energy startups in Germany" aimed to analyse various activities of startups within the German energy sector.





RESEARCH QUESTIONS

Energy-transition is a dominant topic in Germany.

- How emerging technologies are intervening in the Energy sector and facilitating ongoing energy transition?
- Change in value proposition (What are they offering?), Targeted Customers (Who are they targeting?)
- Who are the actors funding or supporting these technologies and business models?



METHODOLOGY AND DATA

External data sources:

- Startupdetector (Berlin based startup)
- Innoloft startup and innovation platform

Company databases:

- MARKUS (3 million economically active companies from Germany, Austria and Luxembourg listed in the commercial register.
- AMADEUS (more than 25 million public and private companies from 45 European countries, including Germany).

Good alternative to commercial register:

Northdata (Startup package/ API available) <u>https://www.northdata.de/_data#data-api</u>



METHODOLOGYAND DATA..





FINDINGS









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FINDINGS: TECHNOLOGY FOCUS





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FINDINGS: BUSINESS MODEL FOCUS

in five years, more than half of customers will select services based on artificial intelligence used by the supplier instead based on suppliers' traditional brands: Accenture report





BUSINESS MODEL FOCUS..



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BUSINESS MODEL FOCUS..

- Data (Big-Data), Artificial intelligence, Internet of Things and Cloud are key enablers of Platforms business models.
- Software-as-a-Service, Peer-to-Peer (Tradingas-a-Service), Charging-as-a-Service, Batteryas-a-Service are leading XaaS business
 For models.
- Energy-as-a-Service (Flexibility-as-a-Service)
 Solar-as-a-Service and Comfort-as-a-Service are new entrants



incorporation, (b) over the digital technologies (total number of startups=57)



FINDINGS: NETWORK EXTERNALITIES

Metcalfe's law:

"The strength of network (or the value of network) (S) is proportional to the square of the number (N) of connected users in a particular network i.e $S \propto N^2$ "

- Difficult to get the number of subscribers or users of particular XaaS models.
- Assumptions:

 $S \propto \sum (Yearly financial growth)^2$

- Software-as-a-Service, Peer-to-Peer (Trading-as-a-Service), Charging-as-a-Service, Energy-as-a-Service (Flexibility-as-a-Service) have higher network externalities
- Solar-as-a-Service, Battery-as-a-Service are XaaS models with medium network externalities.
- Comfort-as-a-Service, Micro-grid-as-a-Service are XaaS models with low network externalities.

| As-a-Service business model | Central value propositions | Network candidate | Network externality |
|--------------------------------|--|--|------------------------|
| Software-as-a- Service | Cloud-based energy management Resource optimization Cloud-based IT infrastructure /Software Data analytics, visualization and reporting | Energy service companies (ESCOs) Utilities ITC technology provider Commercial and industrial sites | High |
| Charging-as-a- Service | Networked charging stations Charging management Increased property value | EV users EV manufacturers Retailers, municipalities, businesses, companies with parking lots | High |
| Peer-to-peer | Social benefits Direct transactions between peers Energy trading in a network | Prosumers/consumers Utilities/Retailers Households/Commercial buildings and business owners | High |
| Flexibility-as- a-Service | Demand-response potential Load management Saving based incentives | Energy service companies Demand response aggregator, Retailers Industries Households/Commercial buildings and business owner Energy consumers in general | High |
| Energy-as-a- Service | Monitoring and load management services Demand response Design, installation, maintenance and performance management of energy services | IT technology provider Energy service companies Local energy market players Commercial and industrial buildings owners | High |
| Solar-as-a- Service | Green electricity Co-financing for solar projects One shop package for installation, maintenance, operation, management and billing | Residential/Commercial building owner and users Energy service companies Energy retailers | Medium |
| Comfort-as-a- Service | Living space management Improved indoor environmental quality (IEQ) | Real state owner Facility manager Energy service companies Building users | Low |
| Battery-as-a- Service | Battery on cloud Quickly exchangeable battery system Universal storage | EV users Charing infrastructure developer Battery manufacturers | Medium |
| Micro-grid-as- a-Service | Micro-grid deployment financing Operation & maintenance agreements for energy infrastructure Integrated energy system | Utilities/Retailers End-consumers/Prosumer | Low |
| Trading-as-a- Service | Digital marketplace to connect consumers with energy producers Price comparison | Utilities/Retailers Households and commercial building owners Business owners | High |

FINDINGS: GEO-GRAPHICAL DISTRIBUTION

Berlin and Baden-württemberg are leading regions with startups implementing Platform and XaaS Business models





FINDINGS: PATENTS, FUNDING AND STAKEHOLDERS

Startups implementing Blockchain Technology





REFERENCES

- Duch-Brown, N., Rossetti, F. (2020), Digital platforms across the european regional energy markets, Energy Policy 144 (2020) 111612. doi:https: //doi.org/10.1016/j.enpol. 111612.
- Weiller, Claire & Pollitt, Michael. (2014). Platform Markets and Energy Services. Cambridge Working Paper in Economics, Energy policy Research group, available at: <u>https://www.eprg.group.cam.ac.uk/eprg-1334/</u>
- M. Singh, J. Jiao, M. Klobasa, R. Frietsch, Making Energy-transition headway: A Data driven assessment of German energy startups, Sustainable Energy Technologies and Assessments Journal. In Press (2021).



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