Digital Transformation and sustainable business models

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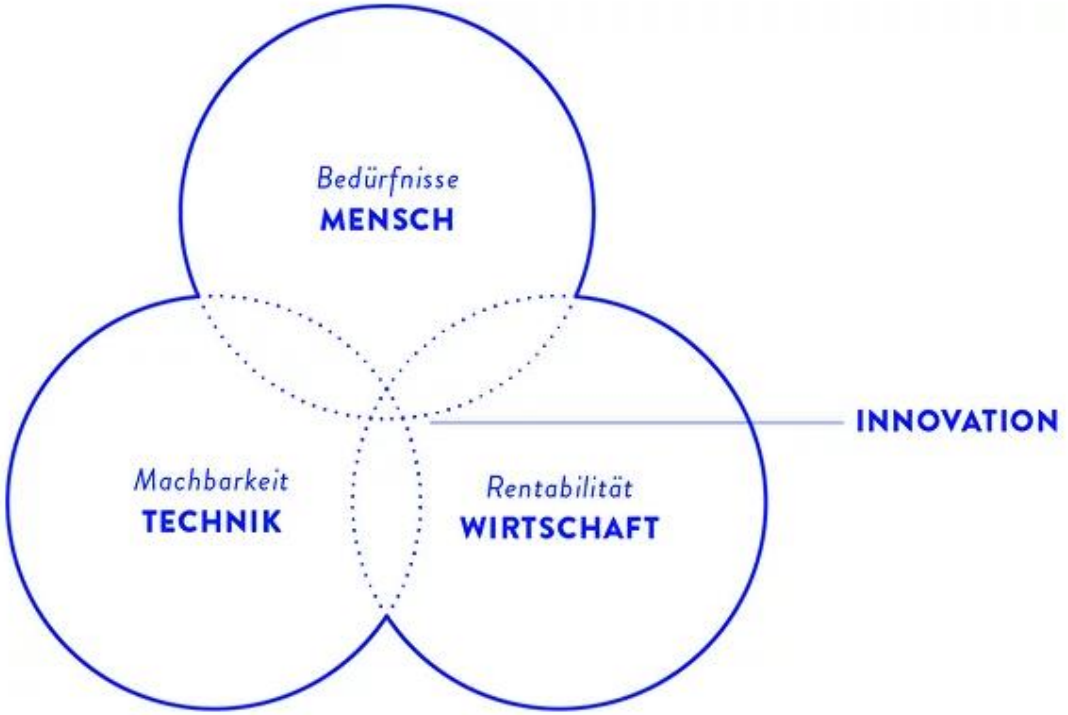
CHAPTER 1 „New sustainable business models“	**CHAPTER 2** „Enablement of Business Models through technologies“	**CHAPTER 3** „Enablement of Business Models through technologies“	**CHAPTER 4** Execution of business models by people and processes“	**EXAM** „New business model marketplace“
▪ Overview & Administrative Things ▪ Digital Transformation ▪ Business Model Canvas & Value Proposition Canvas ▪ Exam Introduction ▪ Sustainability & Technology	▪ Recap ▪ Cloud Computing ▪ Persona Creation & Design Thinking ▪ Analytics & Big Data ▪ Customer Journey Method	▪ Recap ▪ Artificial Intelligence & Machine Learning ▪ Internet of Things ▪ Ecosystems & Platforms ▪ Digital Twin Concept	▪ Recap ▪ Agile Development ▪ Management of Change ▪ Mindset & Culture ▪ Digital Talent	Exam – presentation of each group work (business model created) with active discussion among all students

Recap

Design Thinking Process

Design thinking is a **holistic innovation method** that focuses on **people** and their **needs** while incorporating new perspectives. This gives you a better understanding of the challenges, creates empathy for the users and puts the focus on the central needs.

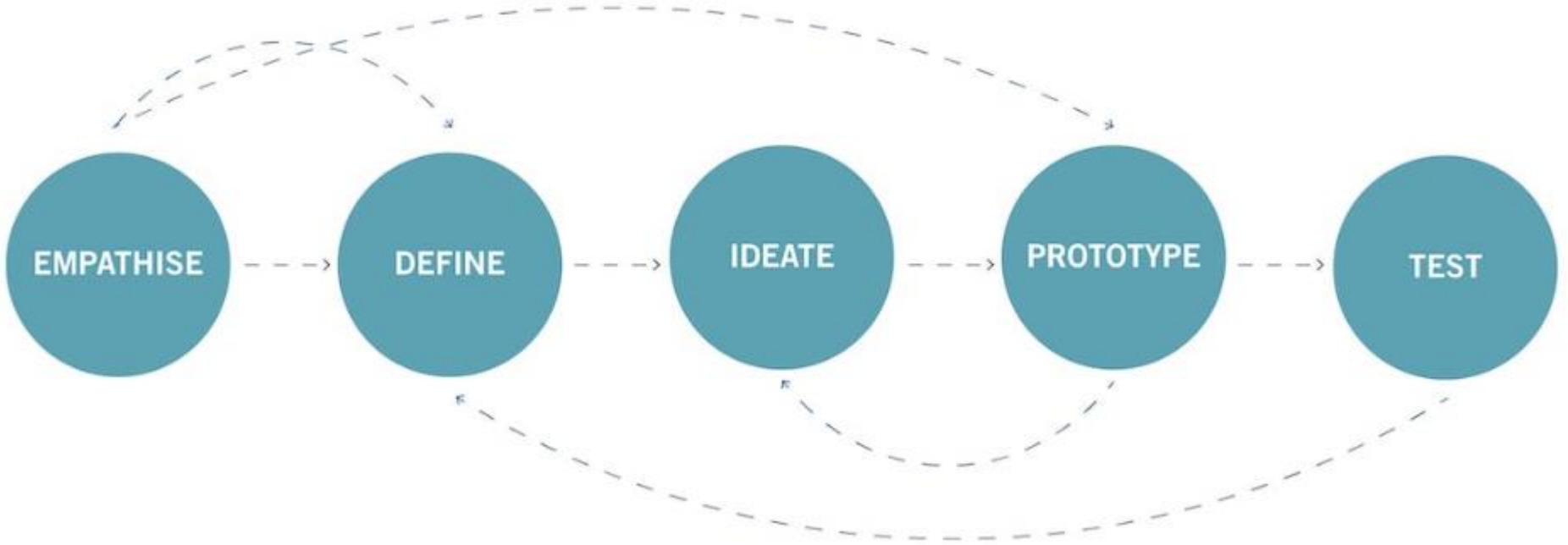
Design thinking is **fast, intuitive, iterative.**



https://www.youtube.com/watch?v=_r0VX-aU_T8

Source: https://berliner-ideenlabor.de/design-thinking

5 Phases of Design Thinking Process



Learn about the audience for whom you are designing, by observation and interview.

Who is my user?
What matters to this person?

Create a point of view/problem statement that is based on user needs and insights.

What are their needs, difficulties, barriers?

What is the big user problem that your team needs to solve?

Brainstorm and come up with as many creative solutions as possible for your problem statement.

Wild ideas encouraged!

Build a representation of one or more of your ideas to show to others.

How can I show my idea?

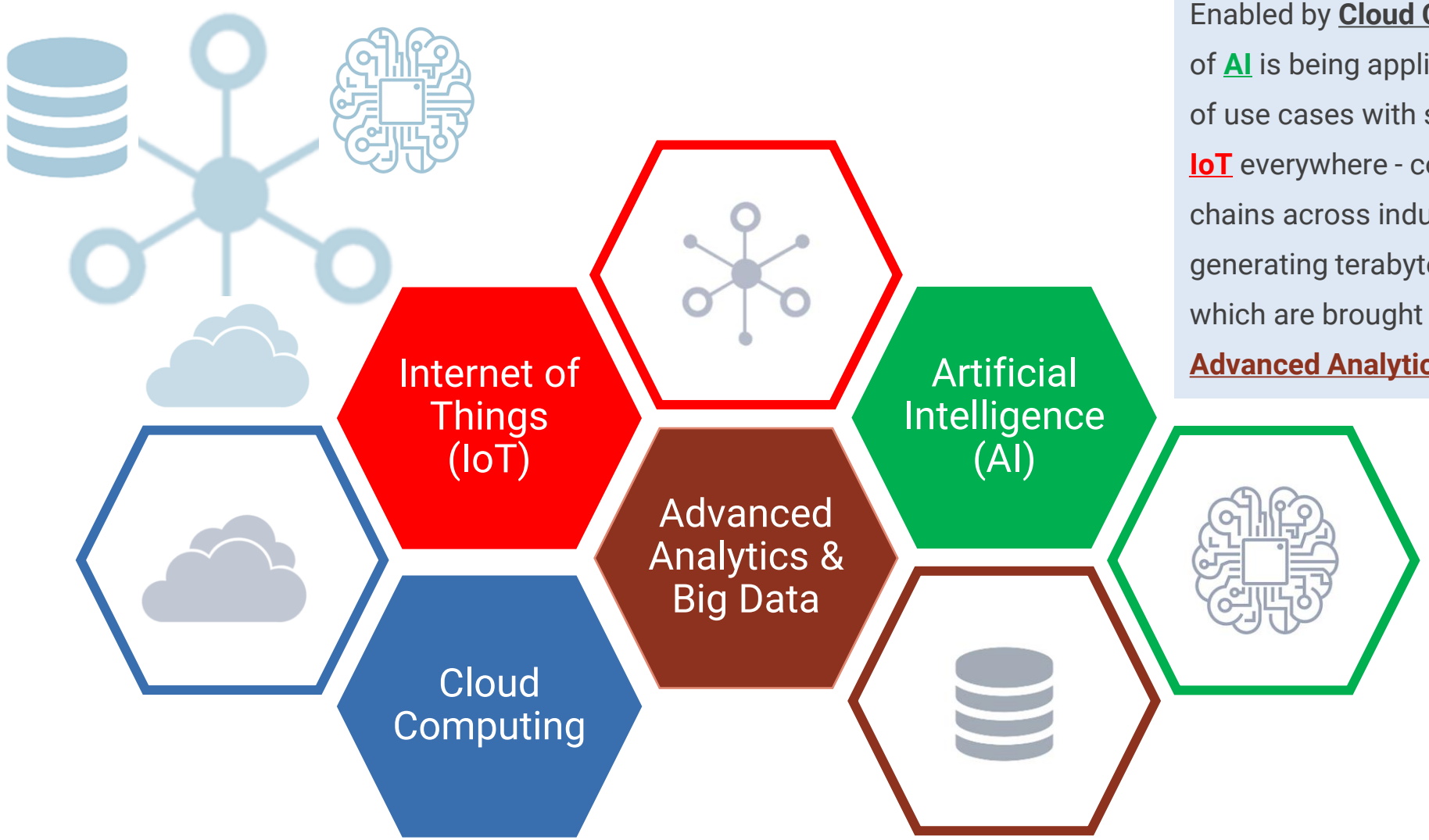
A prototype is just a rough draft!

Share your prototyped idea with your original user for feedback.

What worked?

What didn‘t?

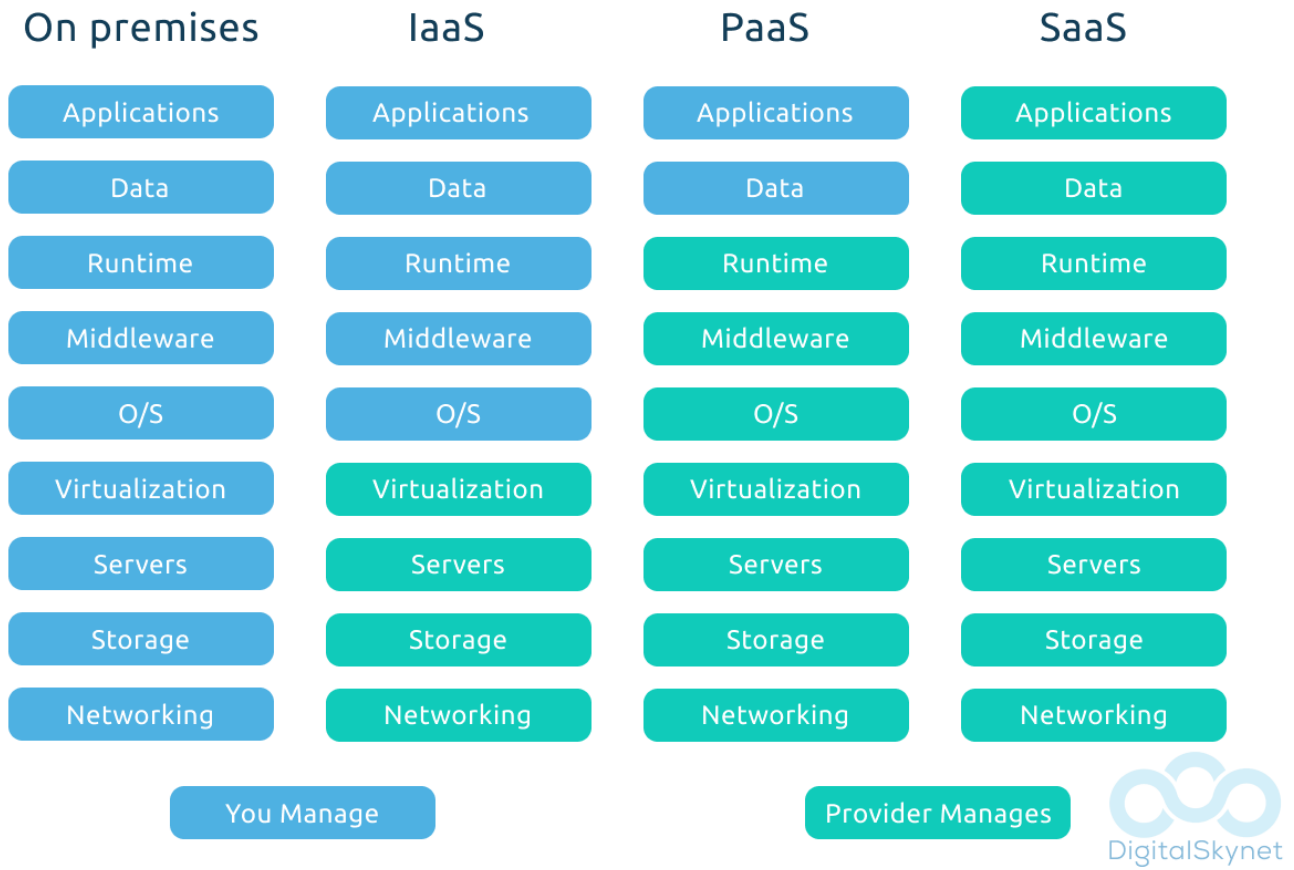
Digital Transformation



Enabled by **Cloud Computing**, a new generation of **AI** is being applied in an increasing number of use cases with stunning results. And we see **IoT** everywhere - connecting devices in value chains across industries and infrastructures. generating terabytes of **Big Data** every day which are brought into insights and value by **Advanced Analytics.**

Cloud Services Models

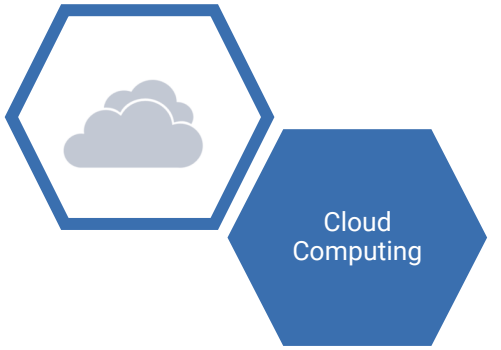
X-as-a-Service (XaaS): Today´s cloud computing providers enable organisations to access a range of resources “as a Service” – from infrastructure to software.



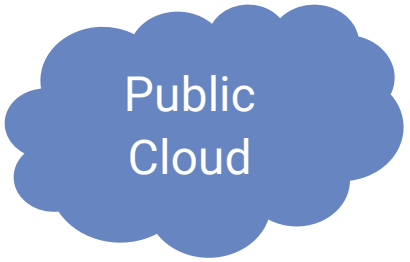
Cloud Computing

Source: https://digitalskynet.com/blog/cloud-service-models-saas-paas-iaas-which-is-better-for-your-business

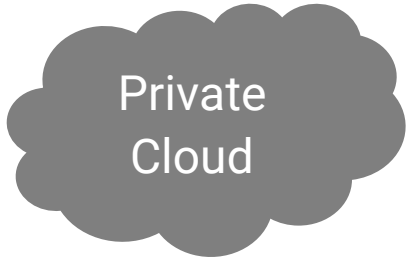
Cloud Deployment Models



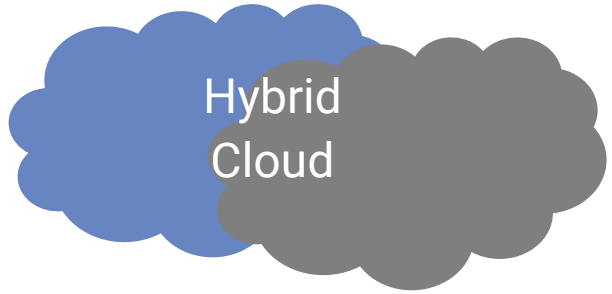
Organisations have a range of choices in cloud deployment models, from a purely public cloud (owned, managed, and operated by a business for anyone´s use) to hybrid cloud (a mix of public and private):



- Fully deployed in cloud
- All app parts running in cloud
- Built in cloud or migrated



- Also Called „on-premises“
- Not many benefits of cloud computing
- Deployment model often same as legacy IT infrastructure but using app management and virtualization technologies
- Reasons often: Legal, Regualtory



- Connect infrastructure and apps between cloud-based resources and existing non-cloud resources
- Extend, grow infrastructure into cloud while conntecting cloud resources to internal system

Source: https://docs.aws.amazon.com/pdfs/whitepapers/latest/aws-overview/aws-overview.pdf#introduction

Warum ist der CLOUD Act für die EU relevant?

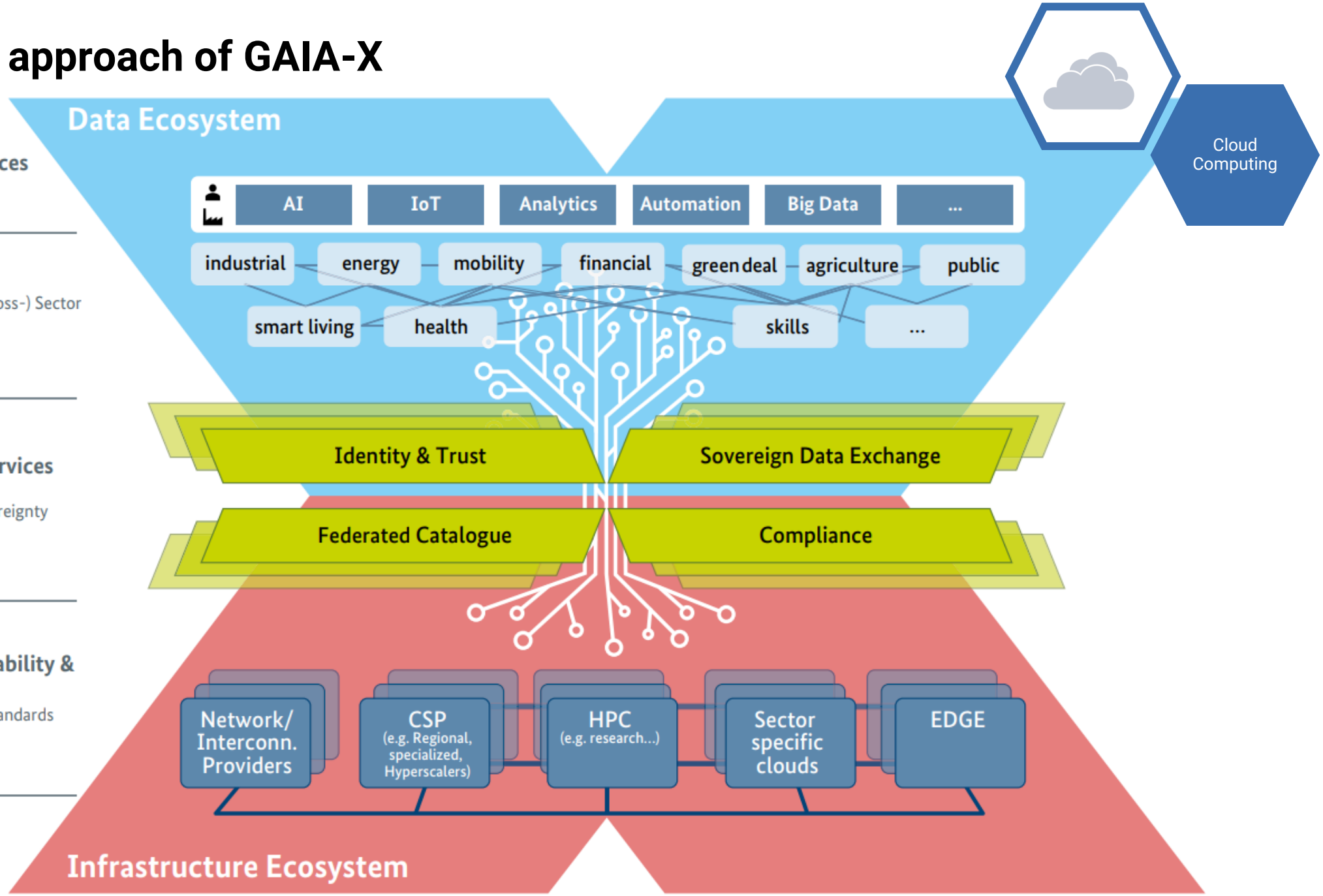
US-Behörden dürfen auf personenbezogene Daten im Ausland zugreifen.

- Provider muss betroffene Person oder Unternehmen nicht informieren
- Provider darf die Daten nicht mehr löschen (auch nicht außerhalb der USA)

Warum ist der CLOUD Act für die EU relevant?

- Provider mit Niederlassungen in den USA unterliegen dem CLOUD Act
- US-Behörden können Zugriff auf europäische Server mit personenbezogenen Daten fordern
- betroffene Personen werden vermutlich nicht informiert

Architectural approach of GAIA-X



Recap - Business Model Canvas

Key Partners

Key Activities

Cloud

Key Resources

Cloud

Value Proposition

Persona

Problem Statement

Idea Generation

Customer Journey

Customer Relationships

Persona

Customer Journey

Channels

Persona

Customer Journey

Customer Segments

Persona

Customer Journey

Cost Structure

Cloud

Revenue Stream

Cloud

Customer Journey

Eco-Social Costs

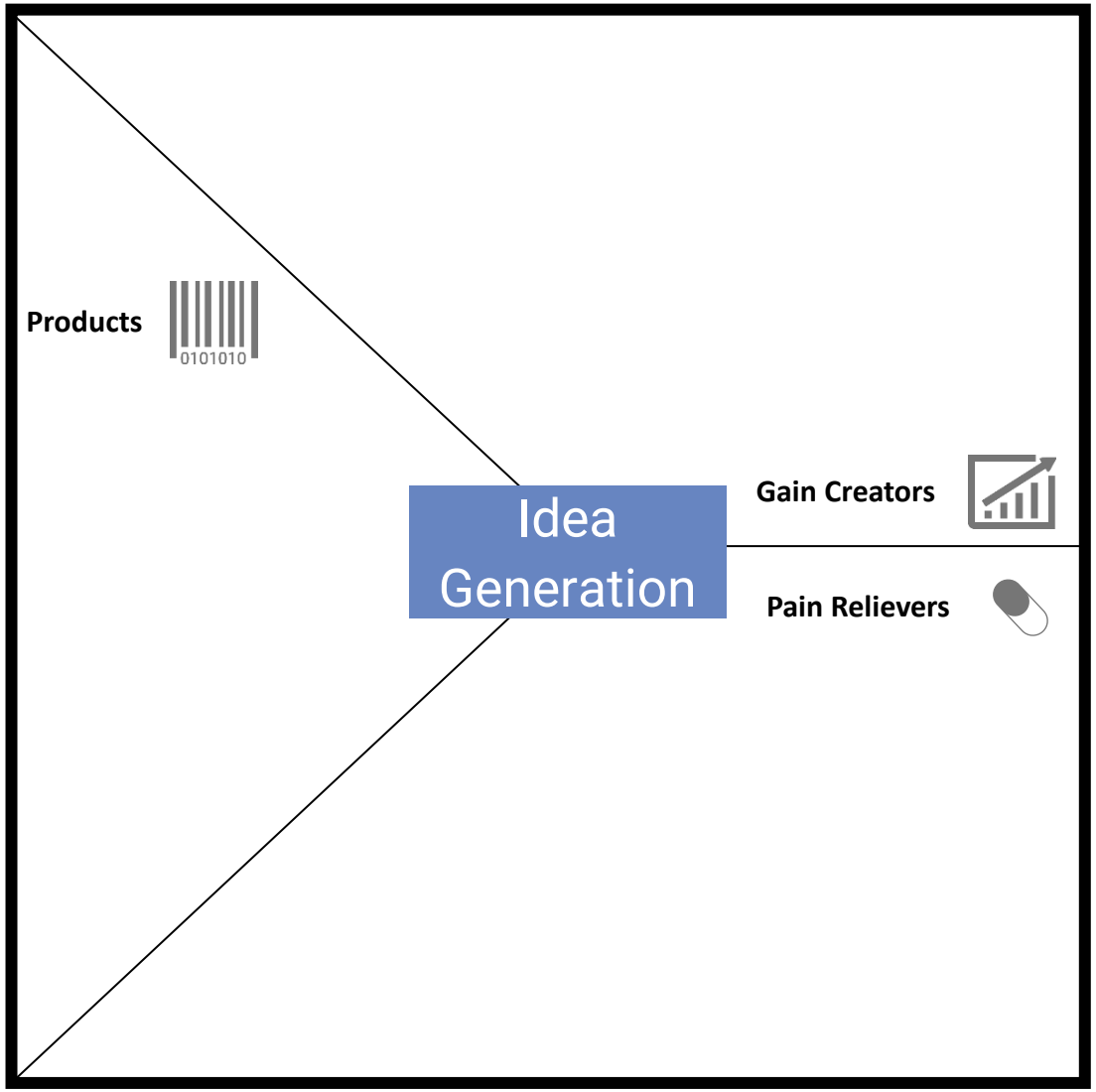
Cloud

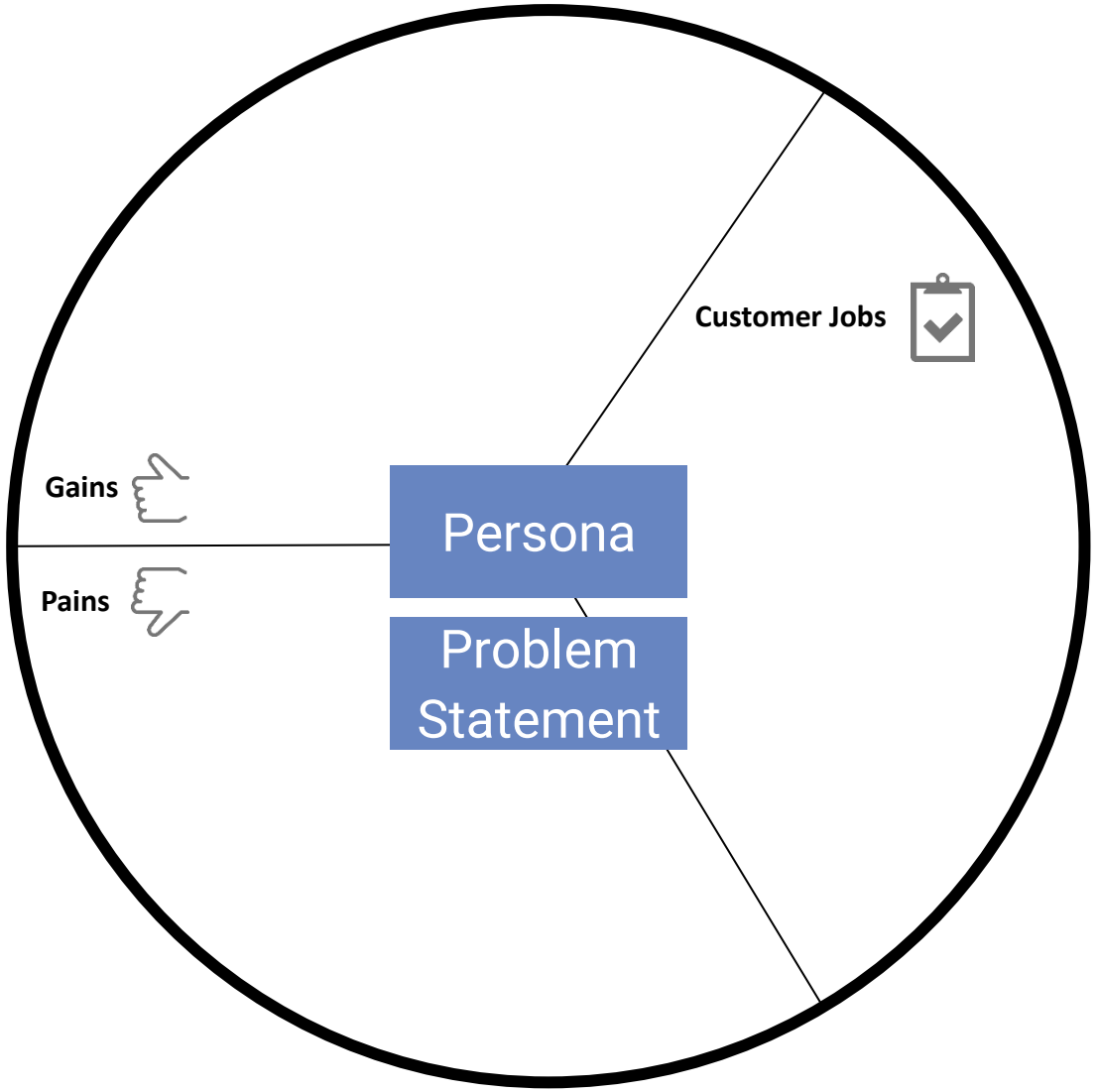
Eco-Social Benefits

Cloud

Customer Journey

Value Proposition Canvas





Cloud & Sustainability

Chapter 2

Environmental motivations – “it’s about time”

Energy consumption is increasing by rising need for computing services & data centers …

- **Energy consumption of DCs** in Europe expected to increase from 2018 to 2025 **by 21%.** Share of Cloud DCs expected to increase from 35%to 60%[1]
- Amount of Energy used by DCs **doubles every four years**[2]
- **ICT industry** is expected to **account for 8% of total electricity** demand by 2030 (Worst case scenario expects 20,9%)[3]

…but cloud services can also be a far more sustainable than traditional on-premises DCs & IT services

- **Shifting** from on-premise DCs **to the public cloud** can reduce an enterprise’s **energy usage by almost 80%** and cut **carbon emissions of workloads by up to 96%**[4]
- According to a recent report by International Data Center (IDC), **cloud computing** can **possibly eliminate 1 billion metric ton of CO2 emission** from 2021 to 2024. This is equivalent to the total emission of 218 million cars over an entire year![5]
- Studies by Hyperscalers show that Cloud services are much more efficient concerning energy consumption & carbon emission compared to on-premise equivalents

Overall energy consumption of ICT industry is rising going along with the broader usage of cloud services. At the same time, **cloud services** can be much more **energy-efficien**t than their on-premises equivalents, supporting a more sustainable way of computing. Additionally, cloud services can be the **accelerator for new innovative sustainable use cases**. The key is to **design cloud services** as **environmental-friendly** as possible.

We can help you with this!

[1] EU report: Energy-efficient Cloud Computing…
[2] https://www.datacenterknowledge.com/industry-perspectives/data-center-dilemma-our-data-destroying-environment
[3] https://www.nature.com/articles/d41586-018-06610-y
[4] https://www.aboutamazon.eu/news/aws/eu-businesses-that-move-to-aws-cloud-can-improve-energy-efficiency-and-reduce-carbon-emissions
[5] https://www.capgemini.com/no-no/2021/04/cloud-sustainability-the-case-for-carbon-accounting-in-it/

Green Cloud Opportunities For Your Business

Your workloads on public cloud services

Modern hardware with highest energy efficiency

Resource sharing & optimized utilization as business model

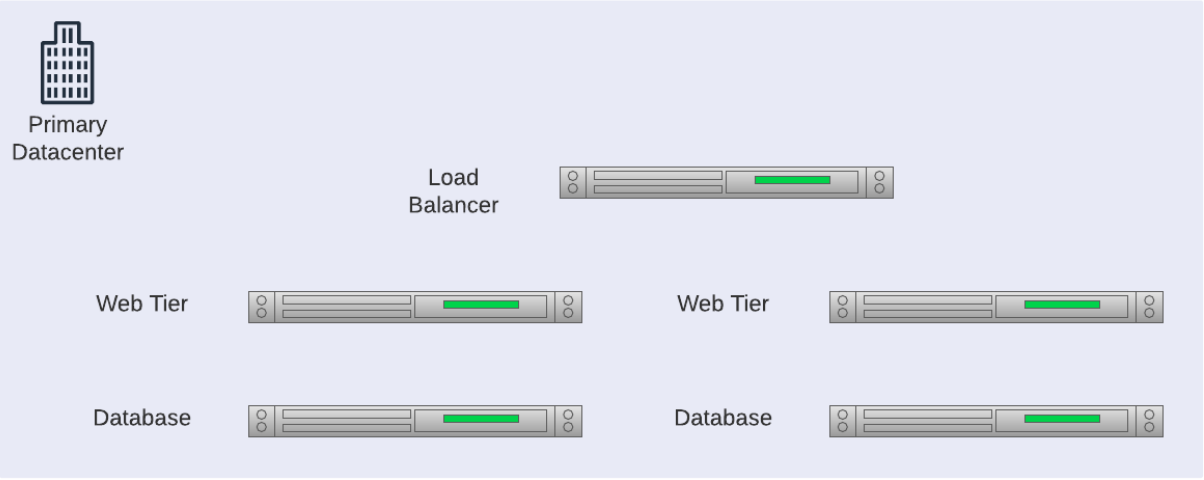
Fast access to advanced technologies

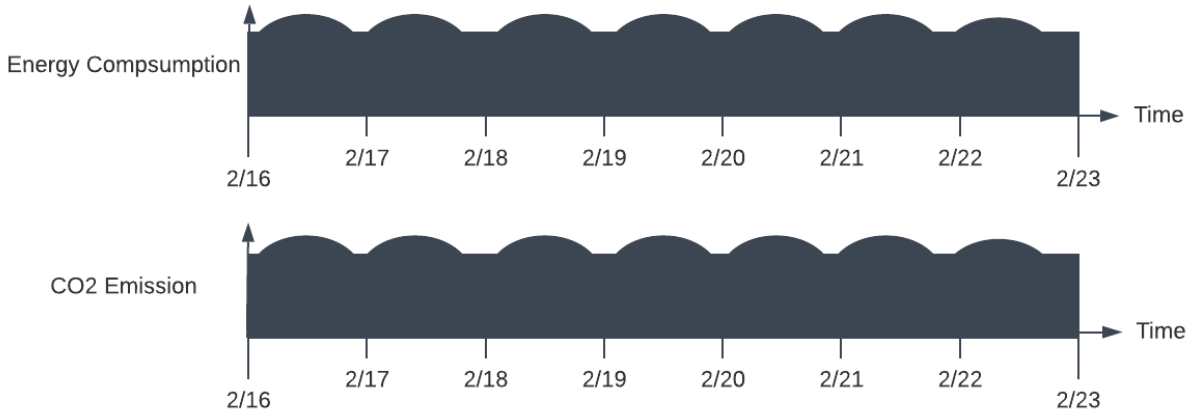
Carbon-efficient data center operations

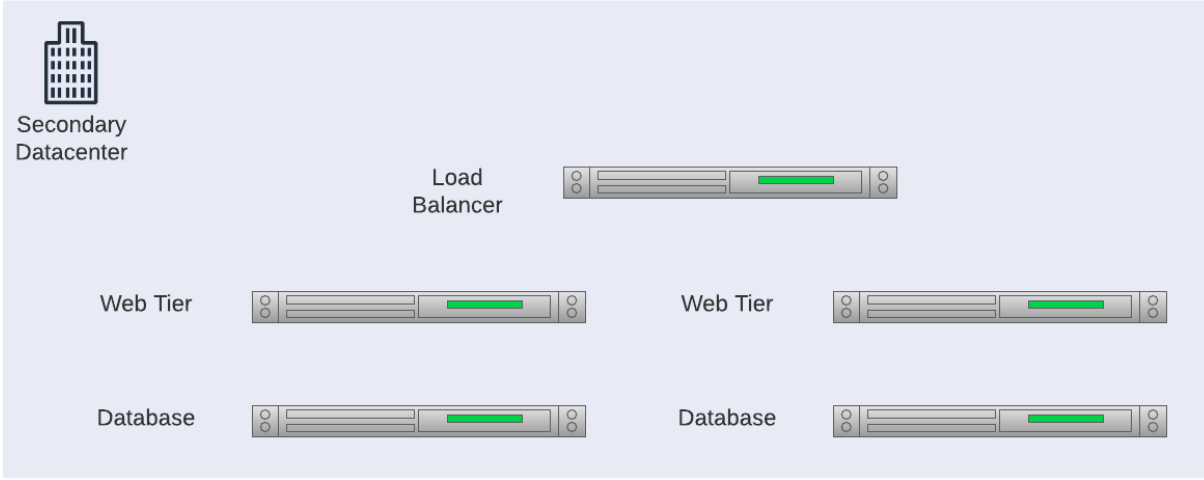
Hyperscalers' ICT

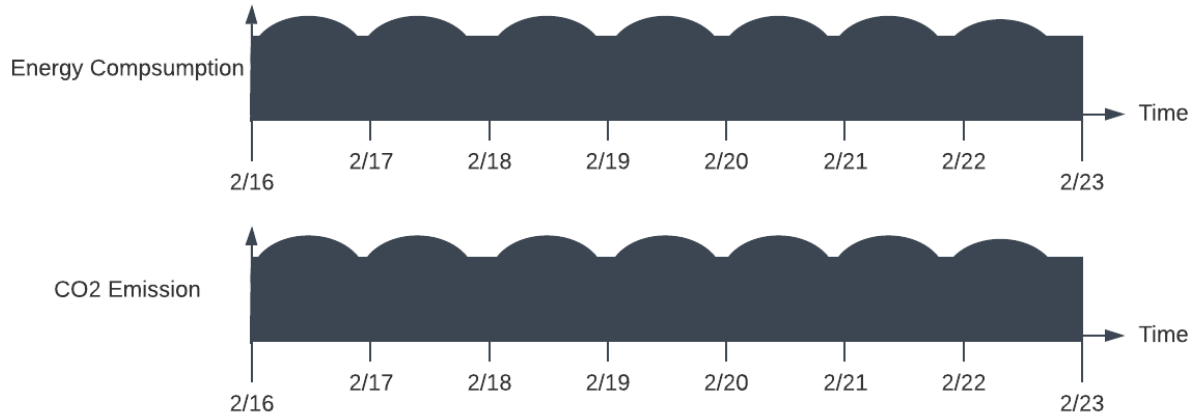
Energy Consumption & Emissions Patterns – On-Premises Data Center

Your on-prem baseline – energy consumption and CO2 emissions follow your load & usage pattern.



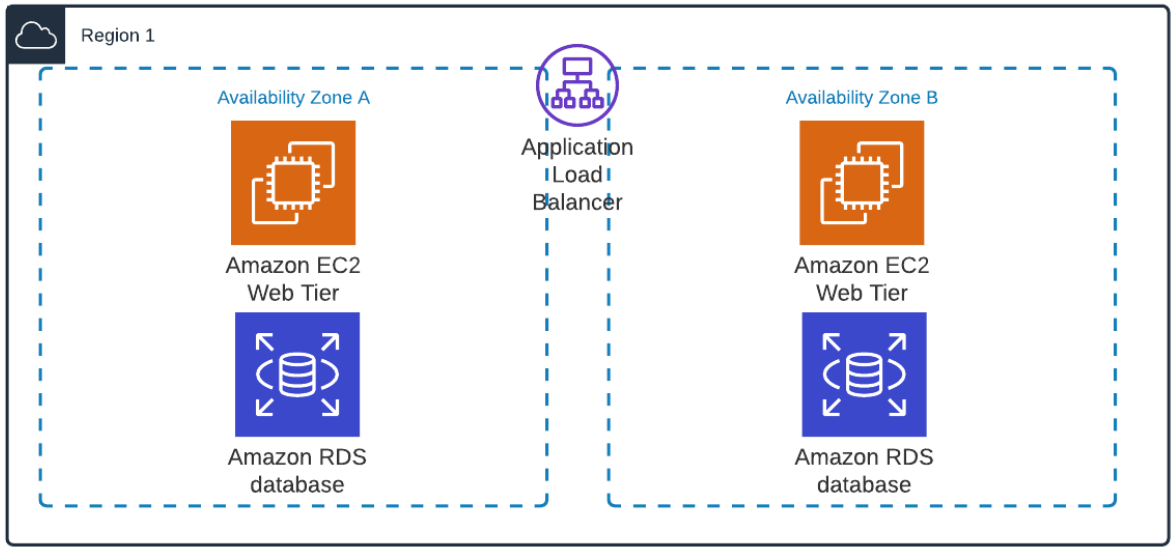


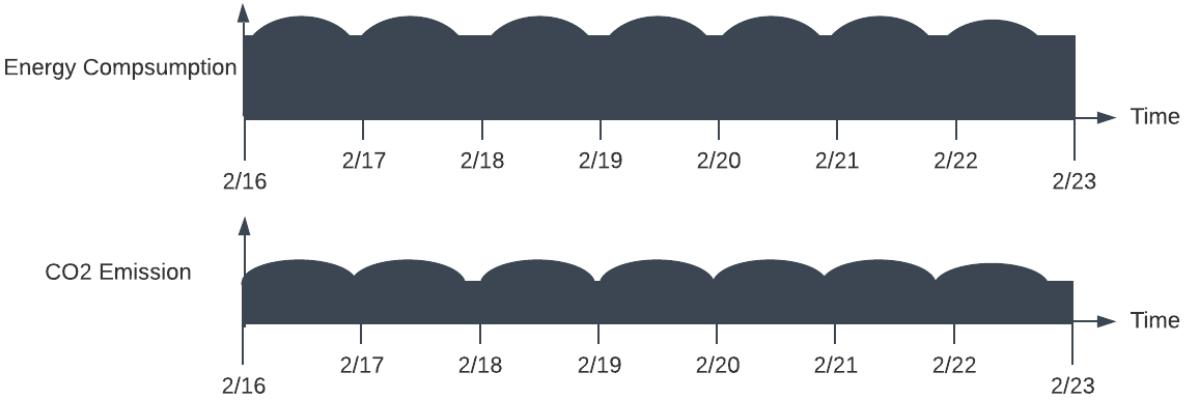


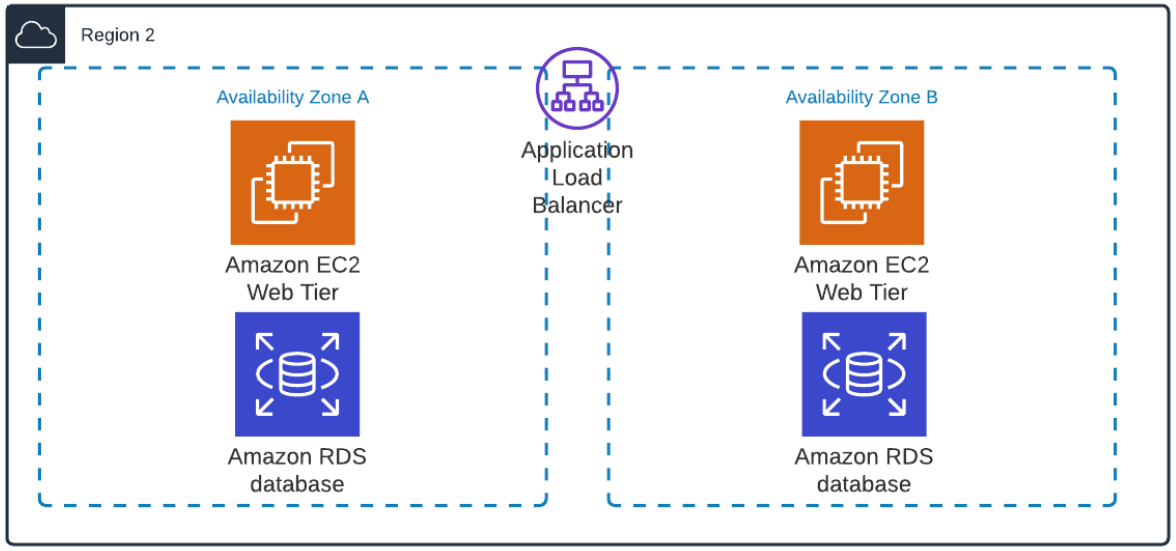


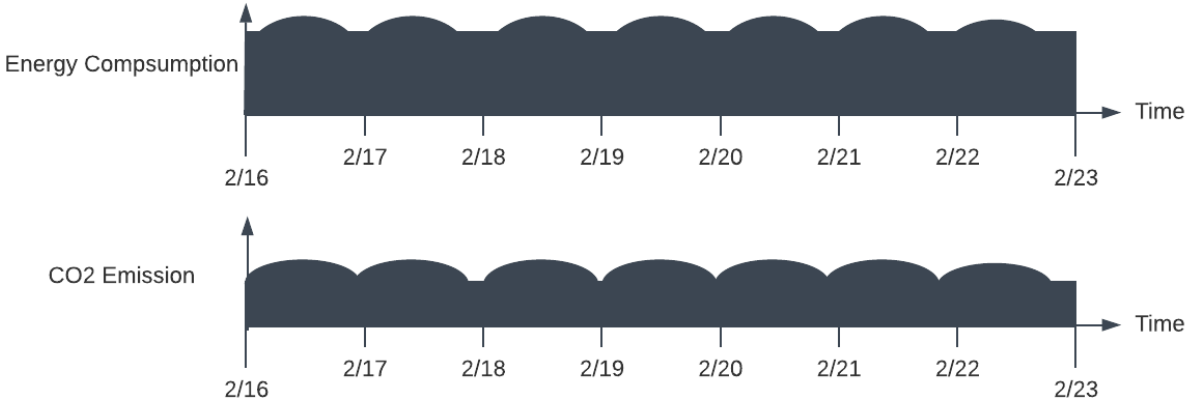
Energy Consumption & Emissions Patterns – Lift & Shift Cloud Migration

After L&S migration, the pattern remain the same with small gains due to the cloud provider's better PUE.



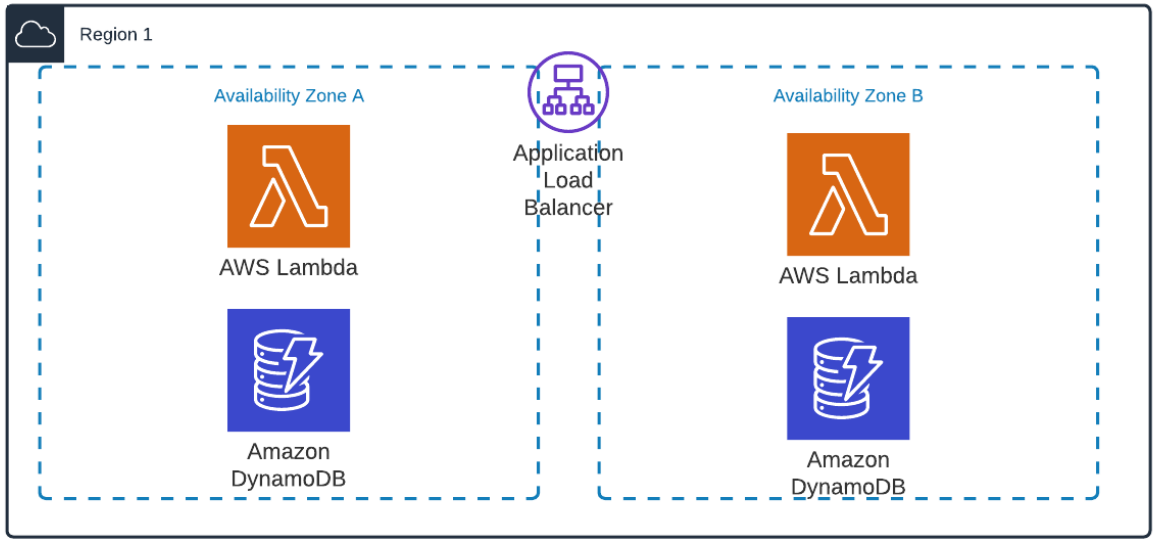


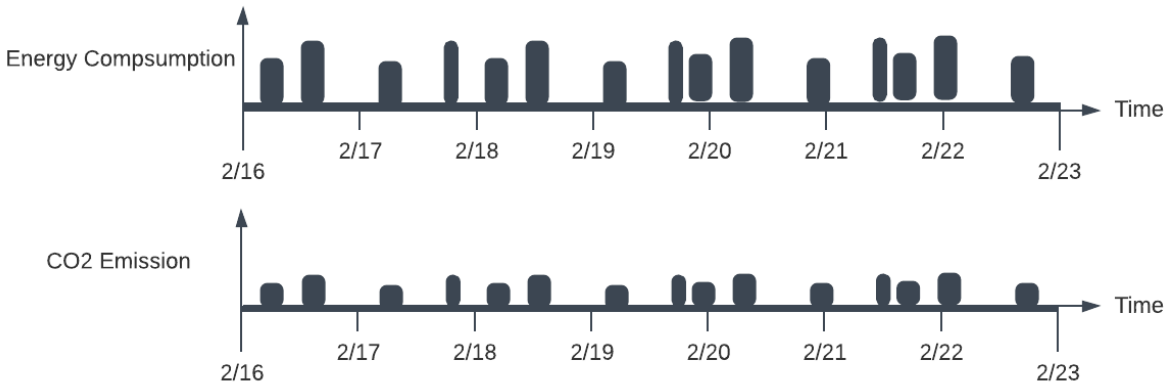


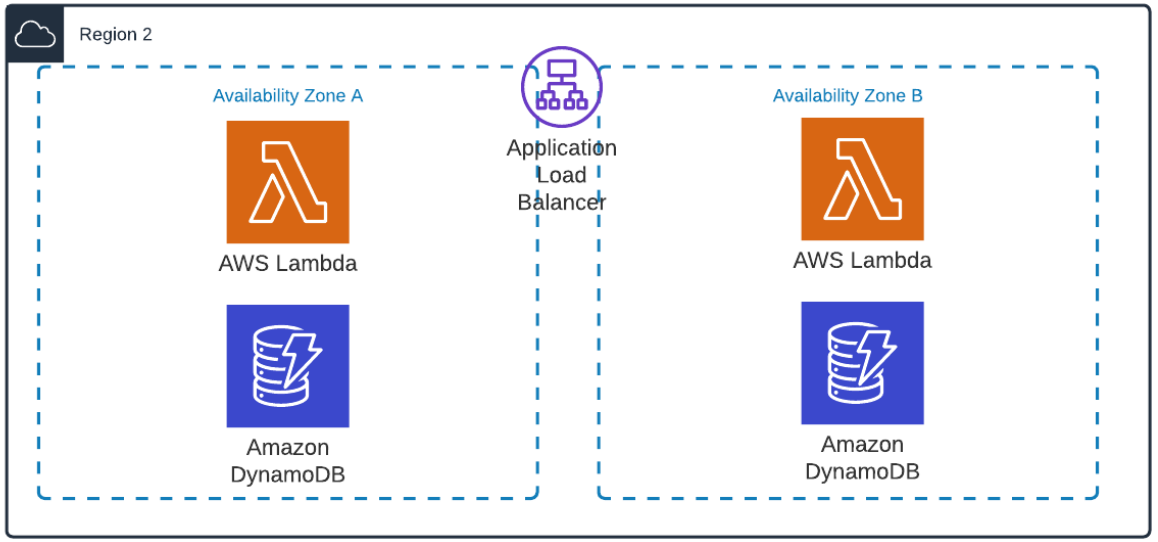


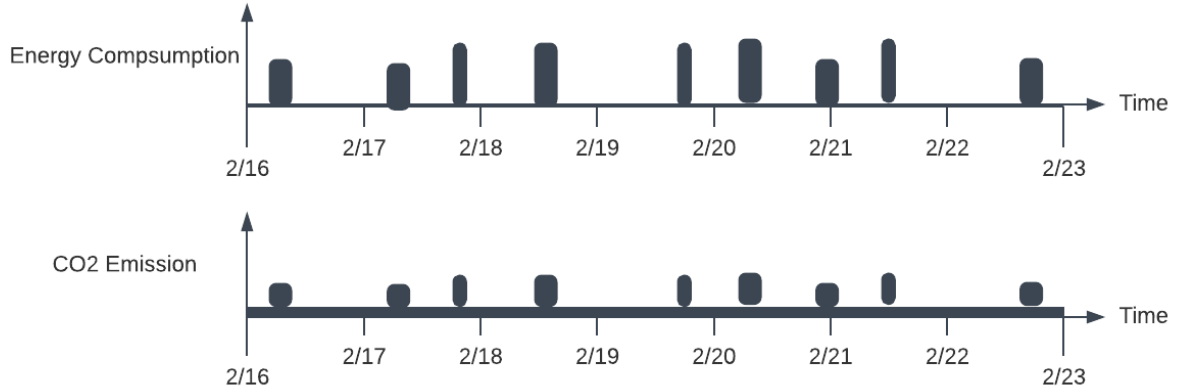
Energy Consumption & Emissions Patterns – Modernization

With modernization and cloud native architecture, e.g. event-driven, cloud resources run only when needed and the pattern changes significantly, resulting in a potential 50% emissions reduction.









Green Cloud Foundation – Cloud Provider Selection

Conscious provider selection is key for setting a successful foundation for cloud-enabled sustainability.

Goals & Commitment

What are the provider's **sustainability goals**?

Are they **carbon-neutral**?

When will they achieve **net zero** or **carbon negative**?

What is their **commitment beyond improving operations**?

Energy Supply & Efficiency

What **energy mix** is powering their data centers?

To what extent are they working with **offset certificates**?

How efficient are their data centers (**PUE**)?

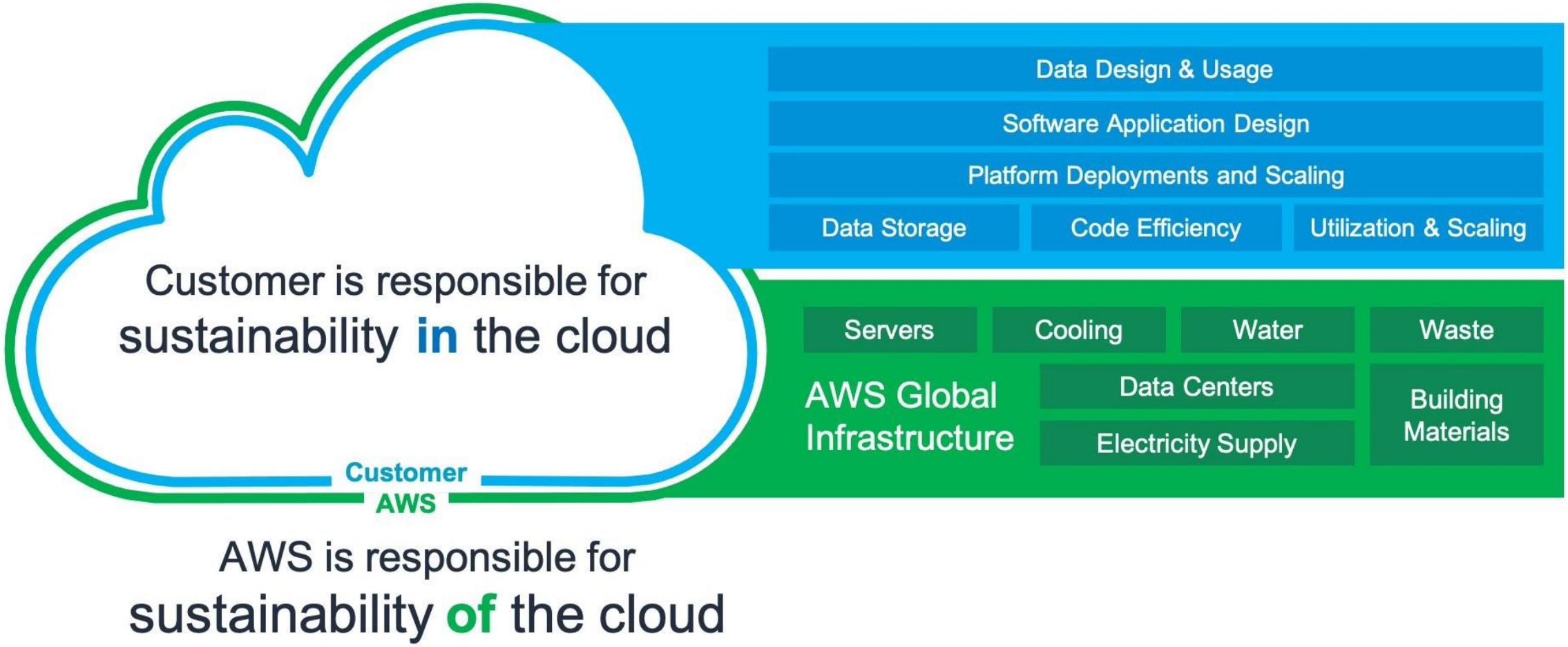
Transparency & Data Availability

Are they transparent about energy mix and efficiency of **individual regions and zones**?

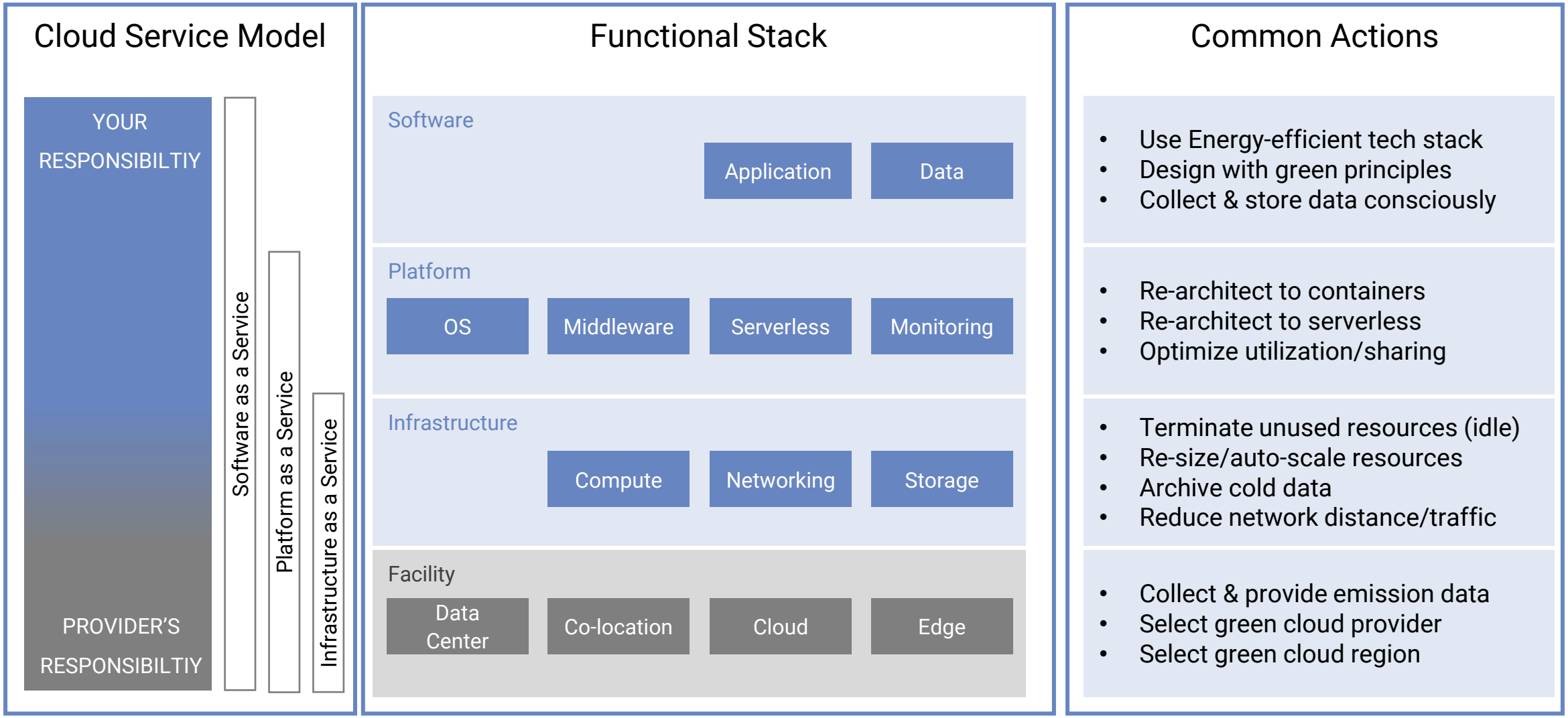
Do they provide data to **measure environmental impact** of **individual workloads**?

Do they provide data to accurately support your **scope 3 reporting**?

Shared Responsibility Model Sustainability – AWS



Shared Responsibility & Optimization Across the (Cloud) Stack … and Your IT Organization!



Green Cloud Foundation – Selecting Regions

Energy mix off the local grid and data center efficiency are vastly different across cloud regions.

Is my workload running on **carbon-neutral energy (including offsets)**?

What is the **carbon intensity** of the region's **local grid**?

How much of the time is my workload running on **renewable energy (no offsets)**?

What is the provider's **data center PUE** in this region (and availability zone)?

AWS

4 carbon-neutral regions
Canada Central (Montreal)
EU Central (Frankfurt)
EU West (Dublin)
US West (Oregon)
(+ GovCloud US)

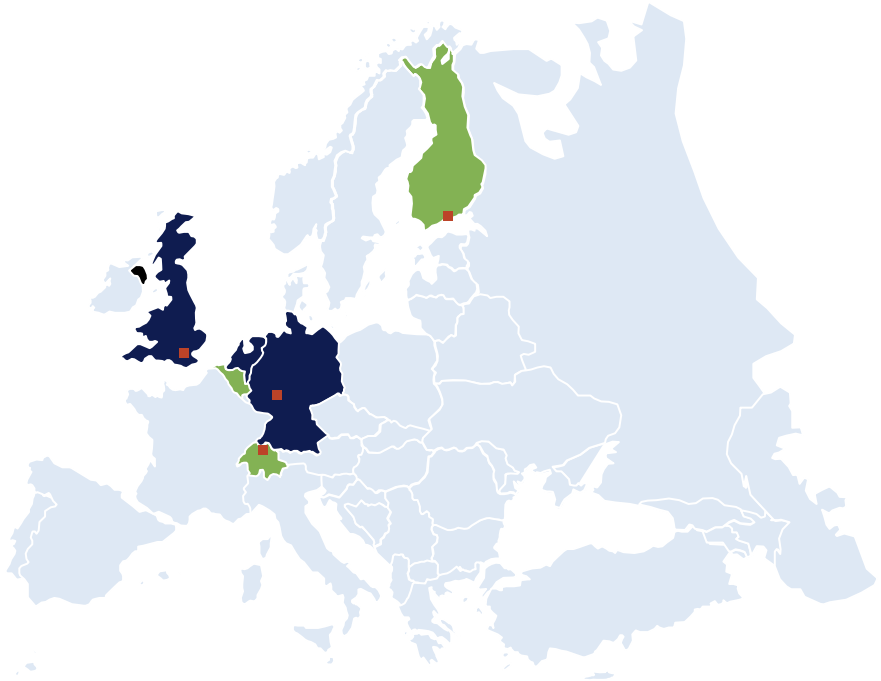
Azure

Carbon-neutral by default

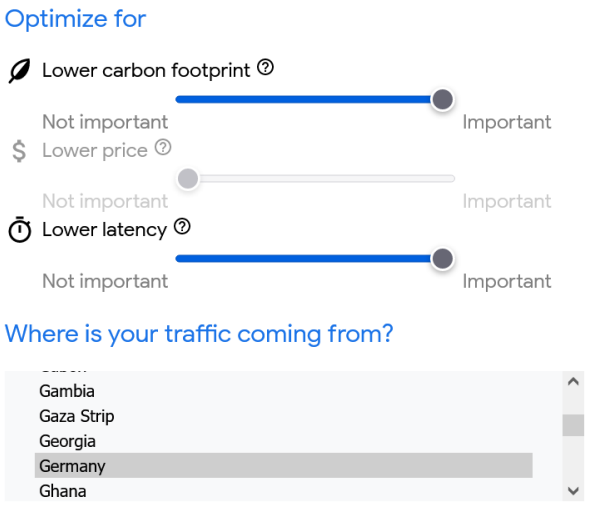
GCP

Carbon-neutral by default

(including carbon offset certificates)



GCP's region picker:



europe-north1
Hamina, Finland

- Carbon Free Energy: 94%
- Grid carbon intensity: 133 gCO2eq/kWh
- Google Compute Engine price: $0.024016 / vCPU-hour

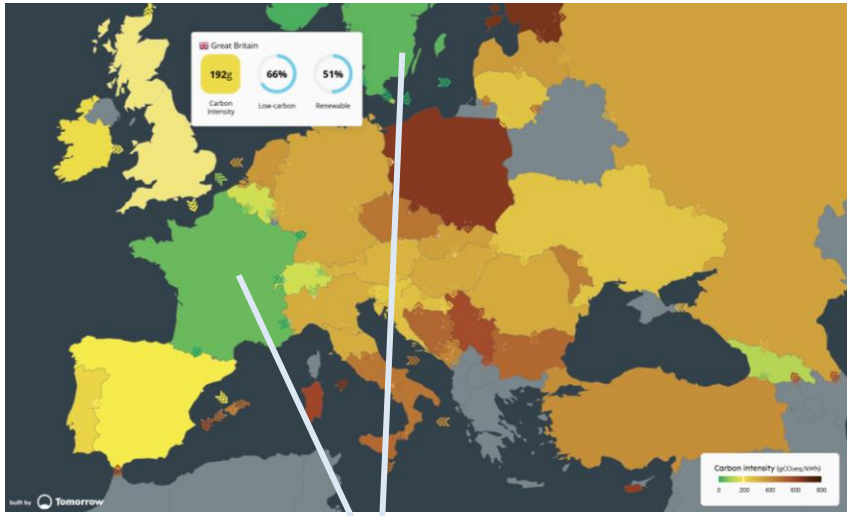
europe-west3
Frankfurt, Germany

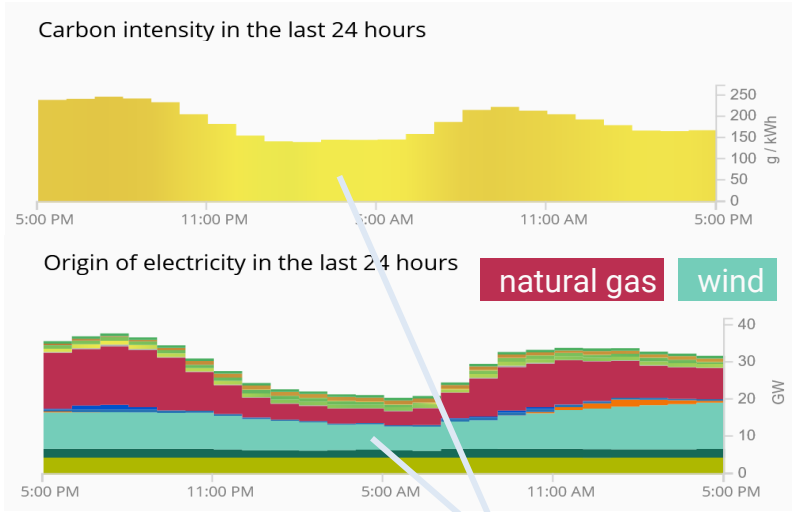
- Carbon Free Energy: 63%
- Grid carbon intensity: 293 gCO2eq/kWh
- Google Compute Engine price: $0.028103 / vCPU-hour

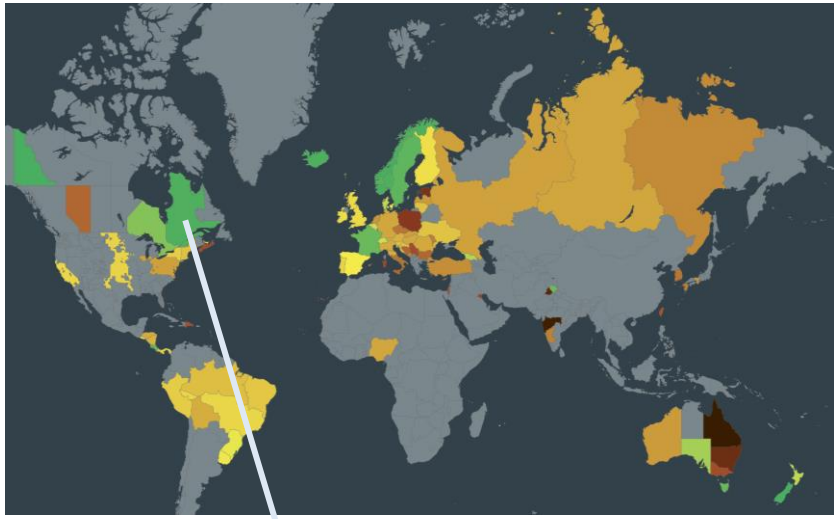
Green Cloud Foundation – Selecting Regions

Carbon intensity of grids powering cloud services vary across place and time.

Use 3rd party data such as Tomorrow's electricityMap (API available) to select regions and place workloads for carbon-optimized execution if providers don't provide first hand information.





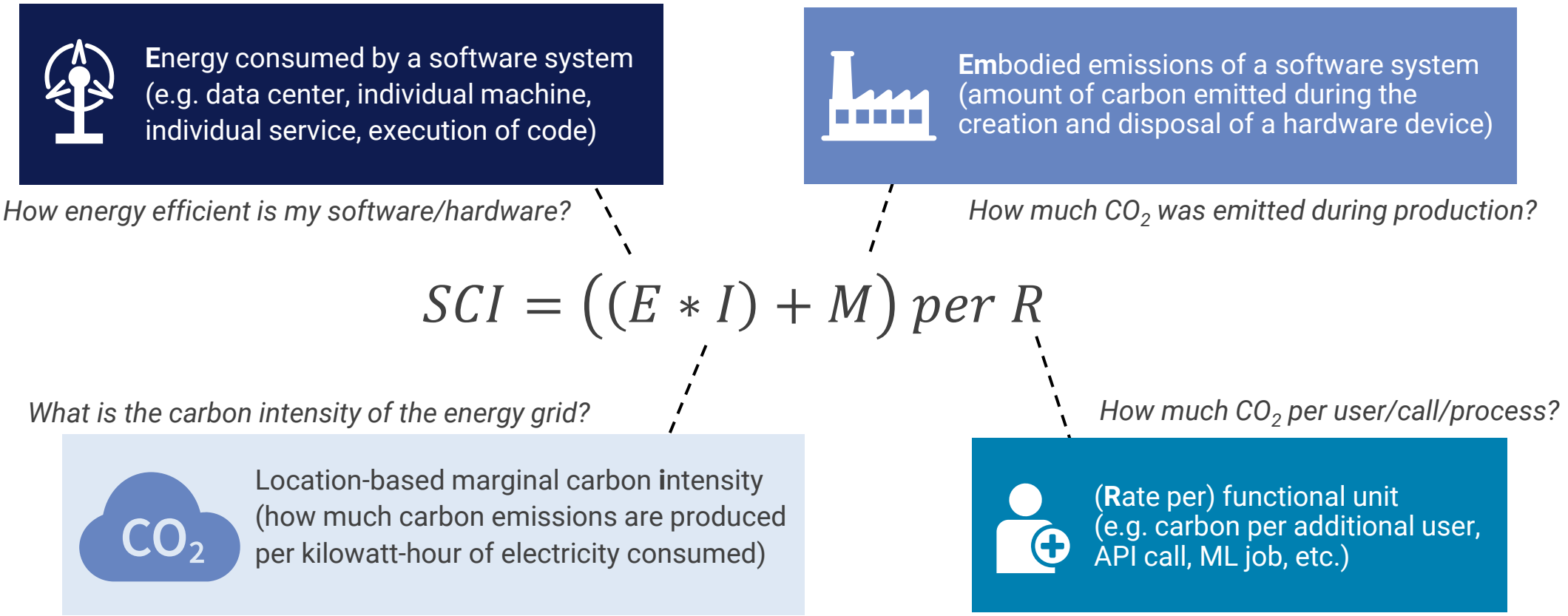


Place latency-sensitive workloads in regions with low carbon intensity on avg. and where latency is still acceptable.
(e.g. responsive end user applications)

Schedule latency-insensitive workloads in off-times with high availability of renewables and low carbon intensity, possibly leverage remote regions.
(e.g. batch jobs, OLAP)

Data and screenshots from elecricityMap by Tomorrow: https://app.electricitymap.org/

Software Carbon Intensity (SCI)



SCI example:

Q1: 3.3g CO_2 emissions per API call

Q2: 2.9g CO_2 emissions per API call

vs.

GHG example:

Q1: total of 34t CO_2 emissions

Q2: total of 82t CO_2 emissions

https://greensoftware.foundation/projects/software-carbon-intensity-sci-specification

Group Work Cloud

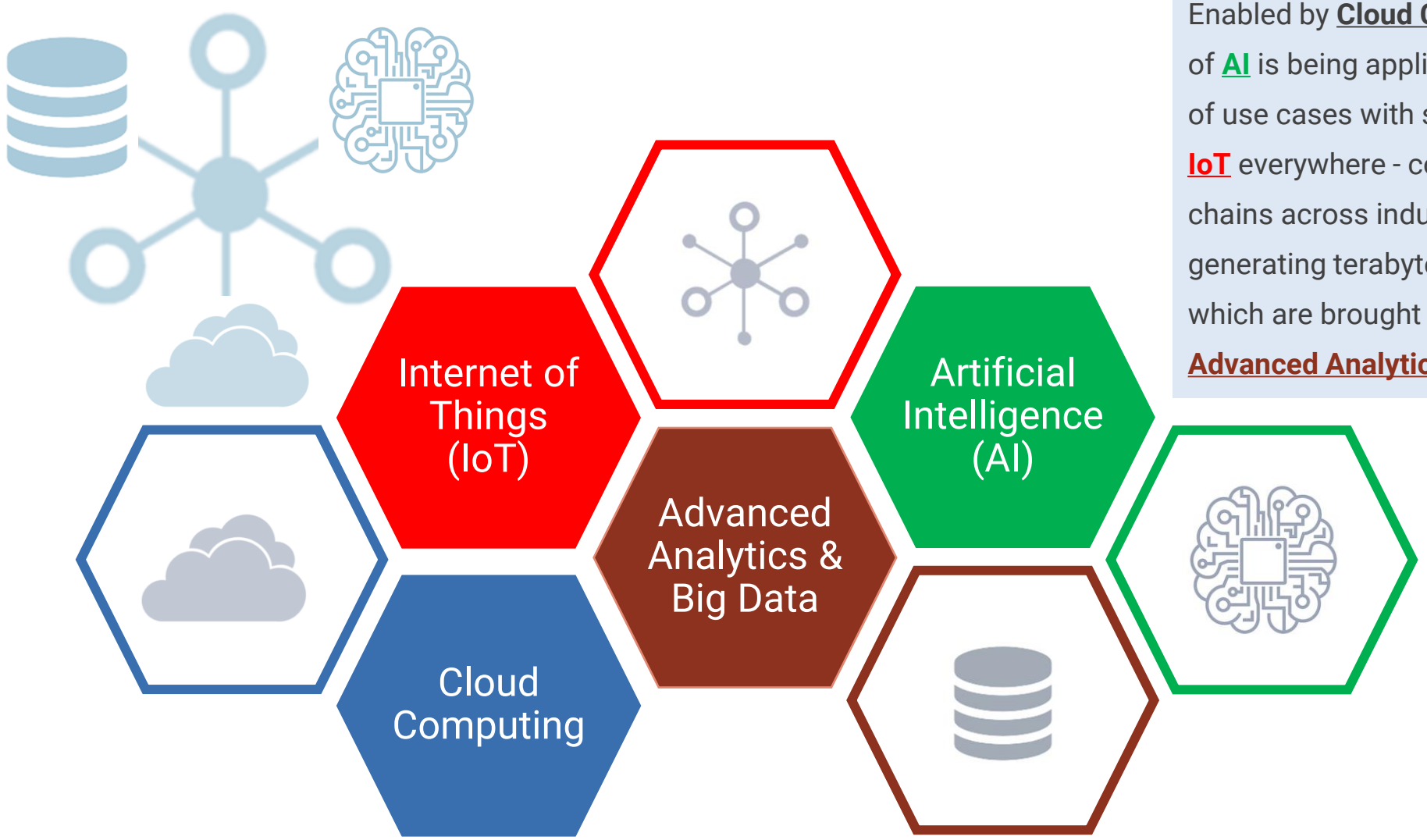
Group Work

Integration of Cloud technologies into defined idea/connection to idea

- Where could cloud technologies be relevant for your idea?
- Guiding questions:
  - Where do you need computing, storage and networking services?
  - Do you have a need for performance, scaling etc.?
  - Cost (Capex vs. Opex)
  - Access from everywhere and at any time needed for your service/product?
  - Any security or data protection issues? Cloud Act, Gaia-X

Data & Analytics

Digital Transformation



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Data is generated constantly and everywhere

RECENTLY: Data Generation is expensive & Linkage is difficult

TODAY: Data is generated constantly & everywhere and Linkage is easy

Public available data and records

Newspaper subscriptions, travel bookings

Names, addresses, marriages, births

Purchases from retailers, loyalty programs

Survey data

Credit history, banking data, insurance data

Linking via Address, Name, Birth, ZIP, Phone

Linking via Accounts, Location, Device ID, Email

Public available data on the web

Website visits, searches

Social media, platforms, accounts

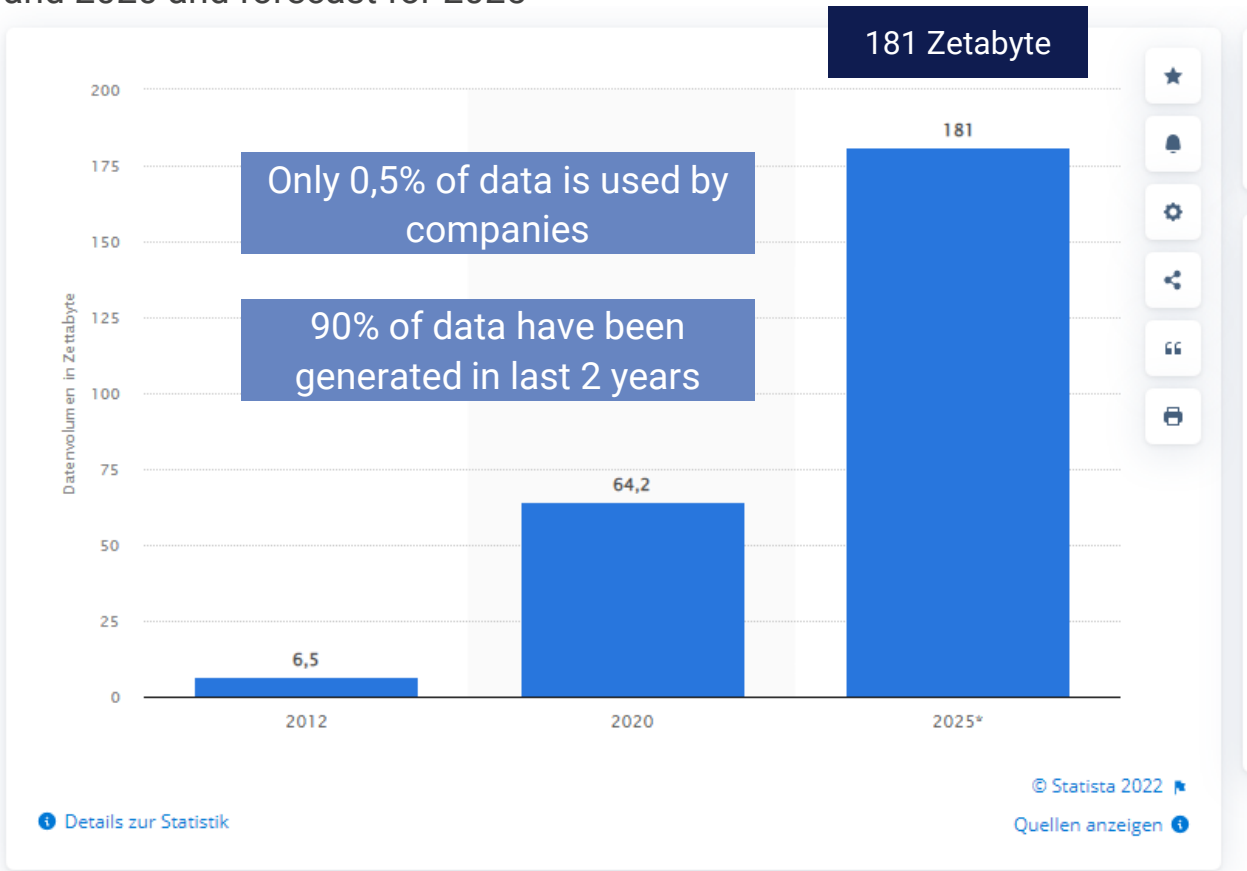
Smartphone & App usage

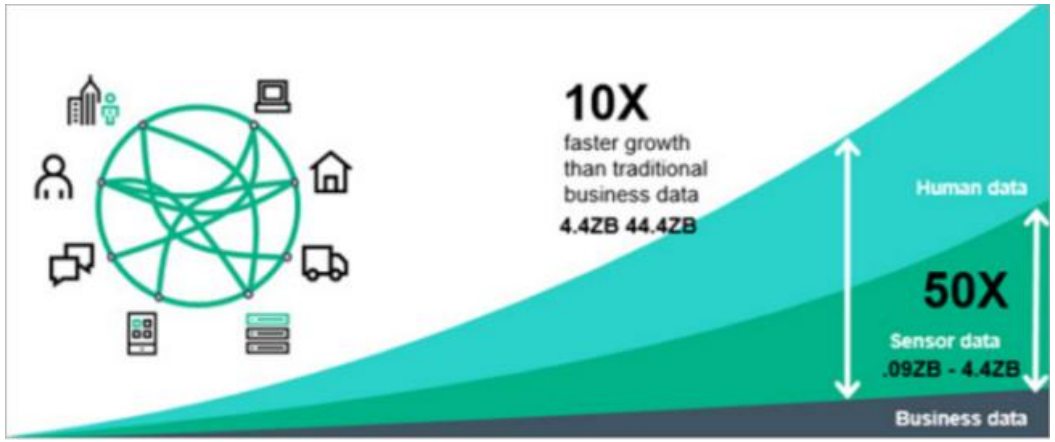
Online purchases

Smart TVs, smart home, connected car, activity tracker

Data is generated constantly and everywhere

Volume of digital data generated/replicated annually worldwide in 2012 and 2020 and forecast for 2025





Source: https://de.statista.com/statistik/daten/studie/267974/umfrage/prognose-zum-weltweit-generierten-datenvolumen/

https://insidebigdata.com/2017/02/16/the-exponential-growth-of-data/

Big Data Characteristics

Volume	Variety	Velocity	Veracity	Value	Variability
Volume of Data from numerous data sources	Different data types: structured, semi-structured, unstructured	Speed how data is generated and how fast data moves	Degree of trustfulness of data	Business value of gathered data	Way of usage and formatting of data

Collection & storage of large amounts of unstructured, semi-structured and structured data and analysis to gain knowledge (advanced analytics, machine learning, predictive modeling).

Big Data - Example

https://www.youtube.com/watch?v=bAyrObl7TYE&t=172s

Big Data - Tools

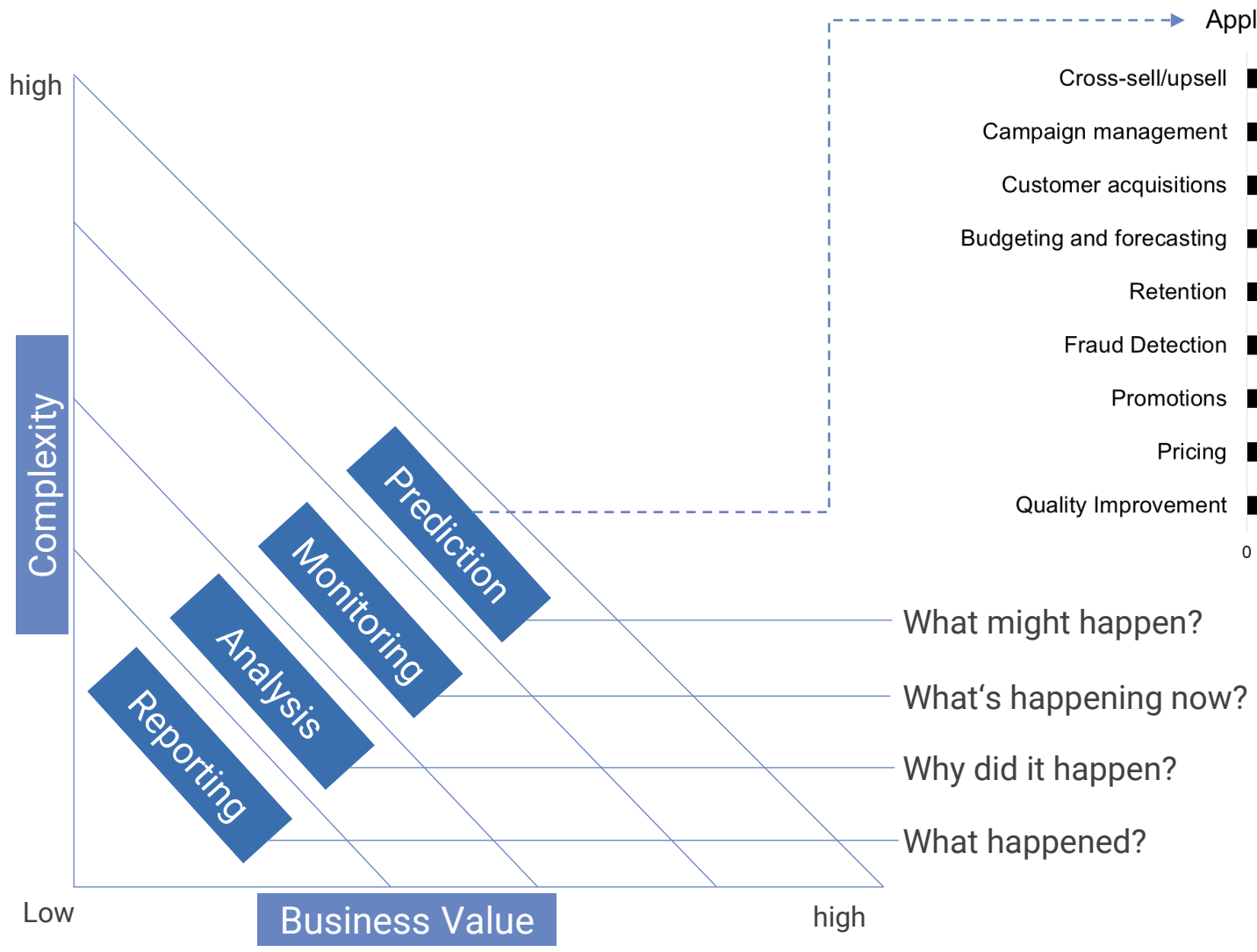
A good and thorough data strategy turns data into value

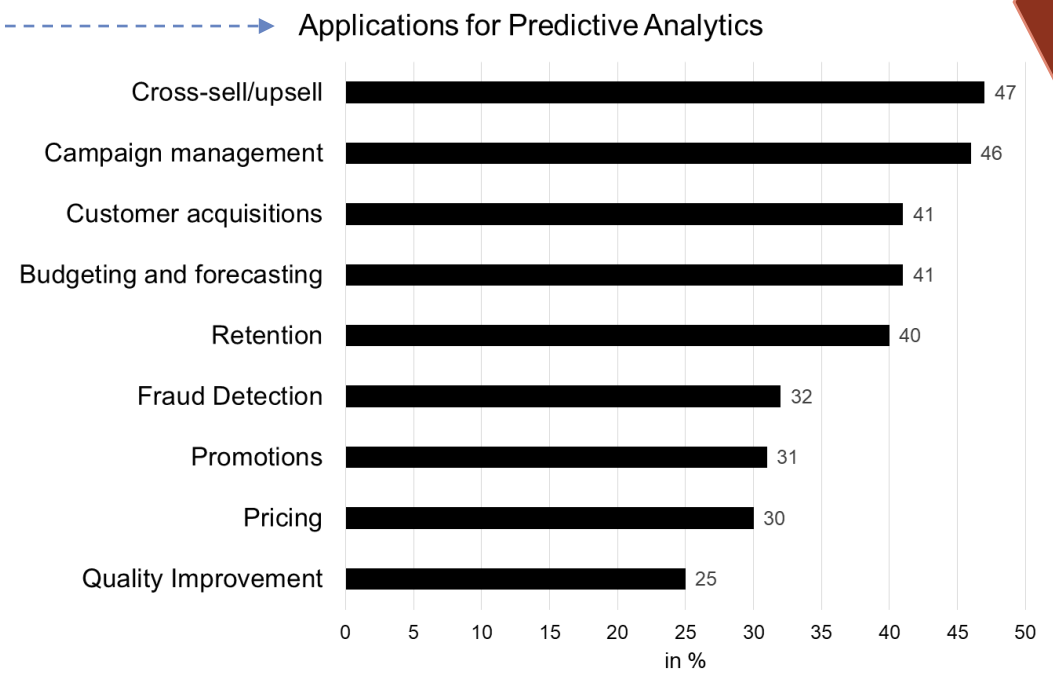
E.g. Link customer data across operational silos to provide better value

Single view of customer

- 360°-View of customer
- Improved customer experience across all channels
- Effective Marketing Campaign Management
- Individual customer approach
- High rate of cross-sell/up-sell
- Improved Client servicing
- Client retention

The challenge is to obtain valuable information from data





Big Data - Critical View

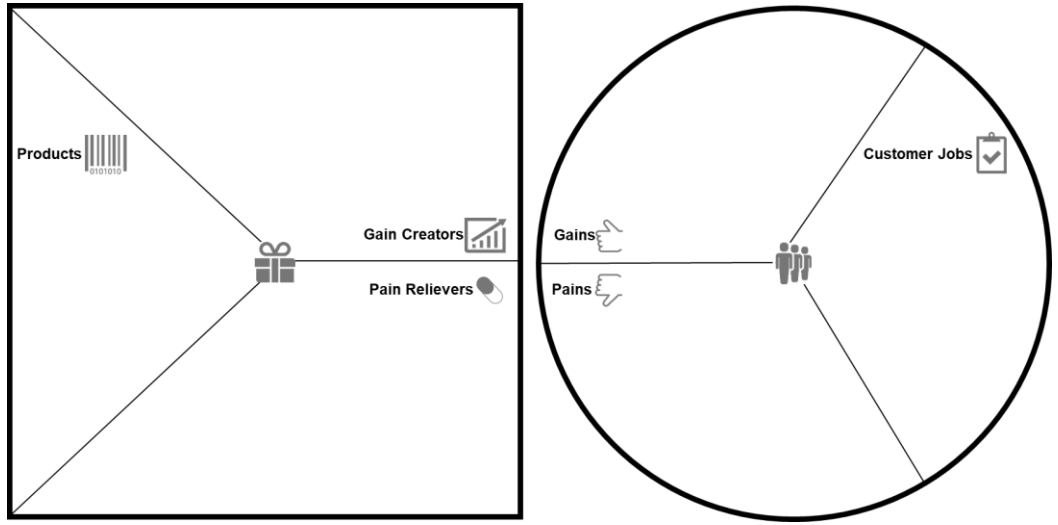
https://www.youtube.com/watch?v=gDcTgGPEqj8

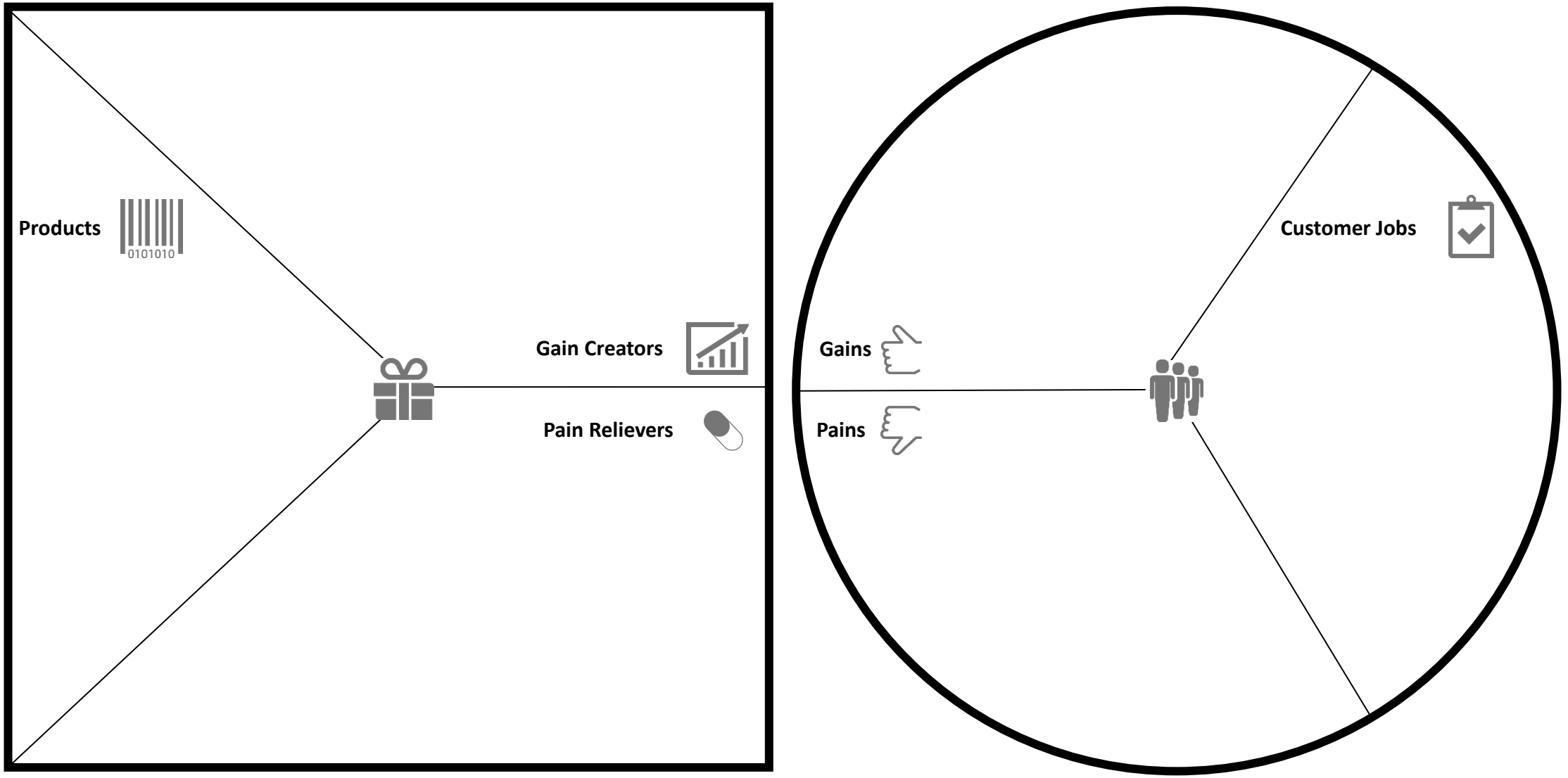
Group Work: VPC

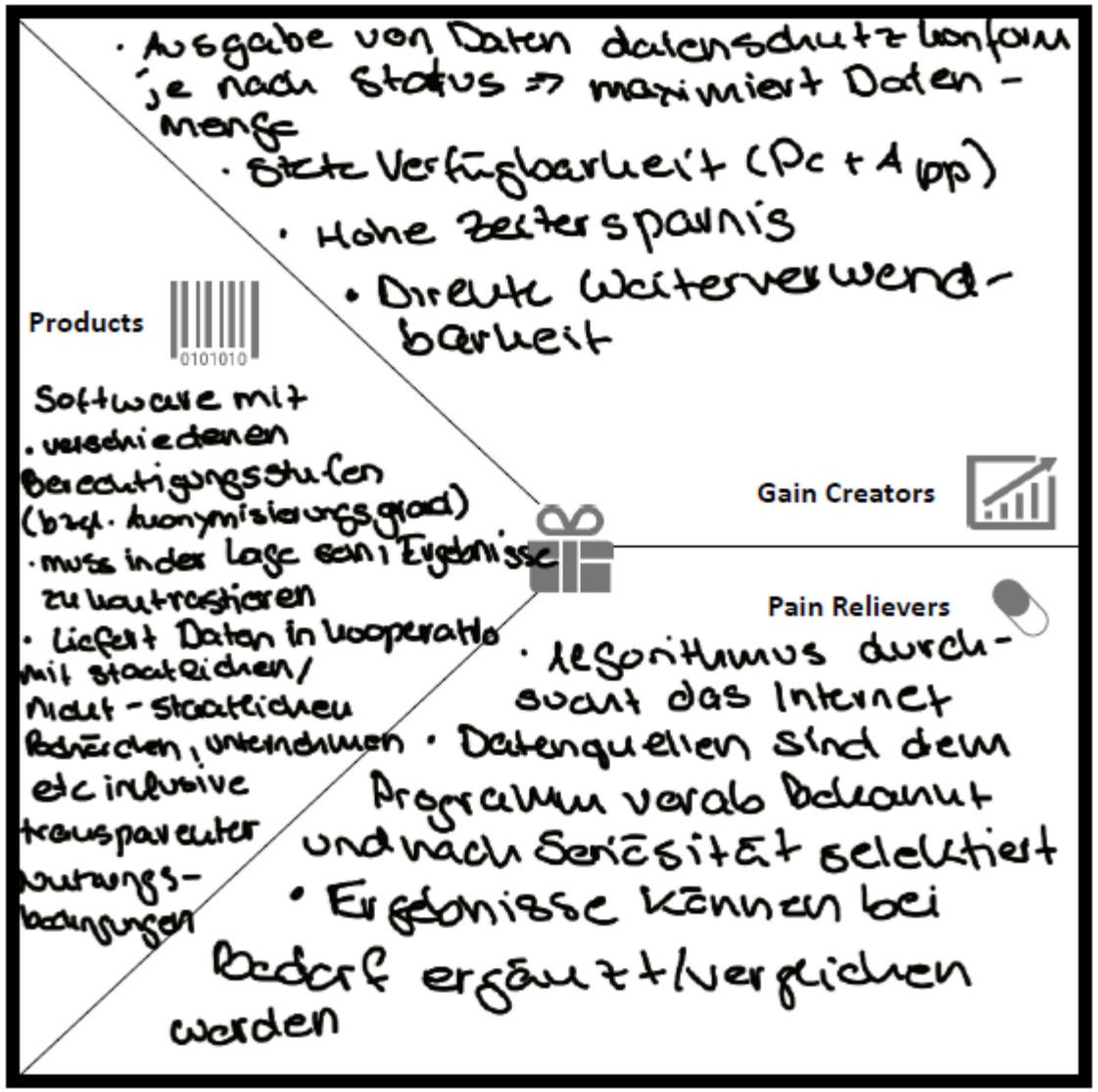
1. Describe the value proposition of your idea (high-level)

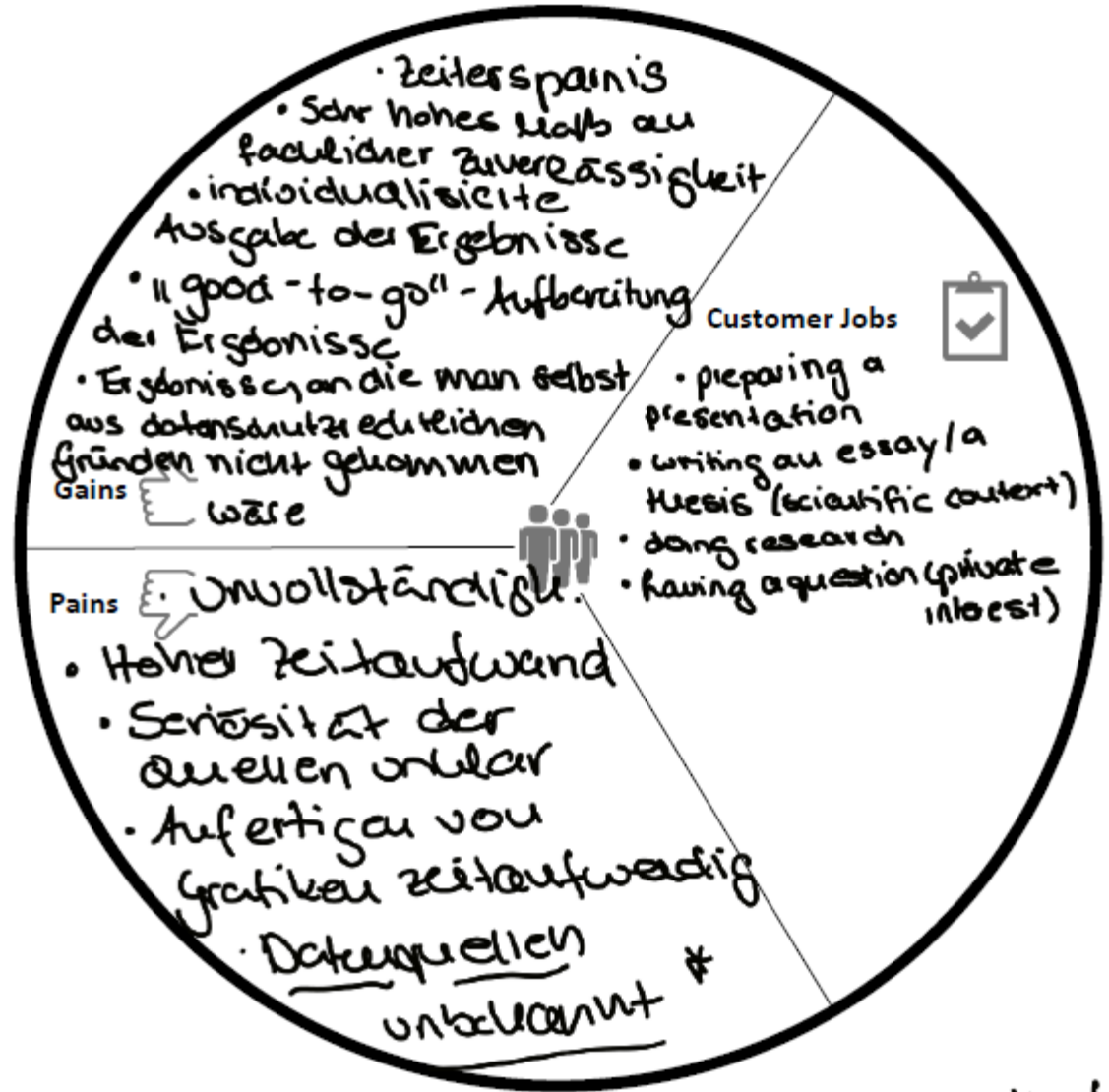
~20 min

Detailed description will be done independently in each group for the exam – but you need to have basic understanding in group about idea

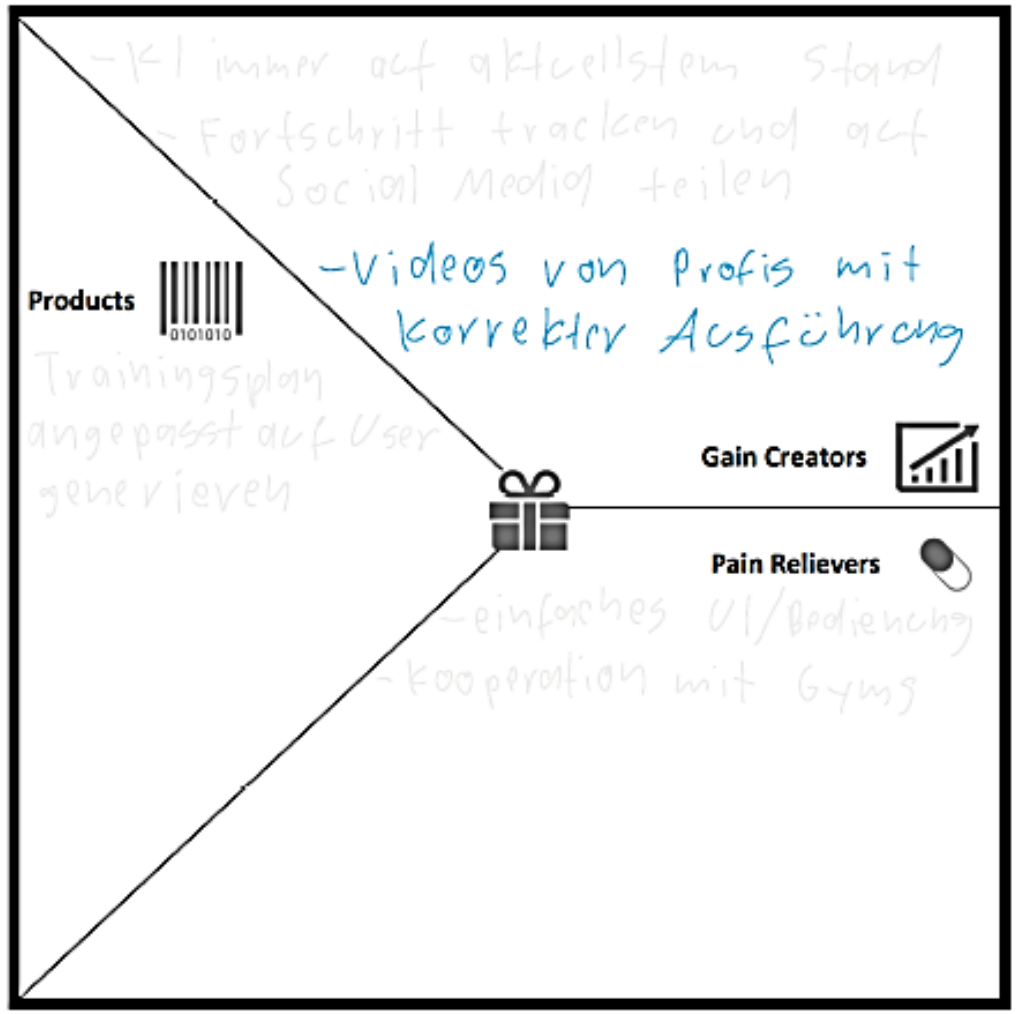


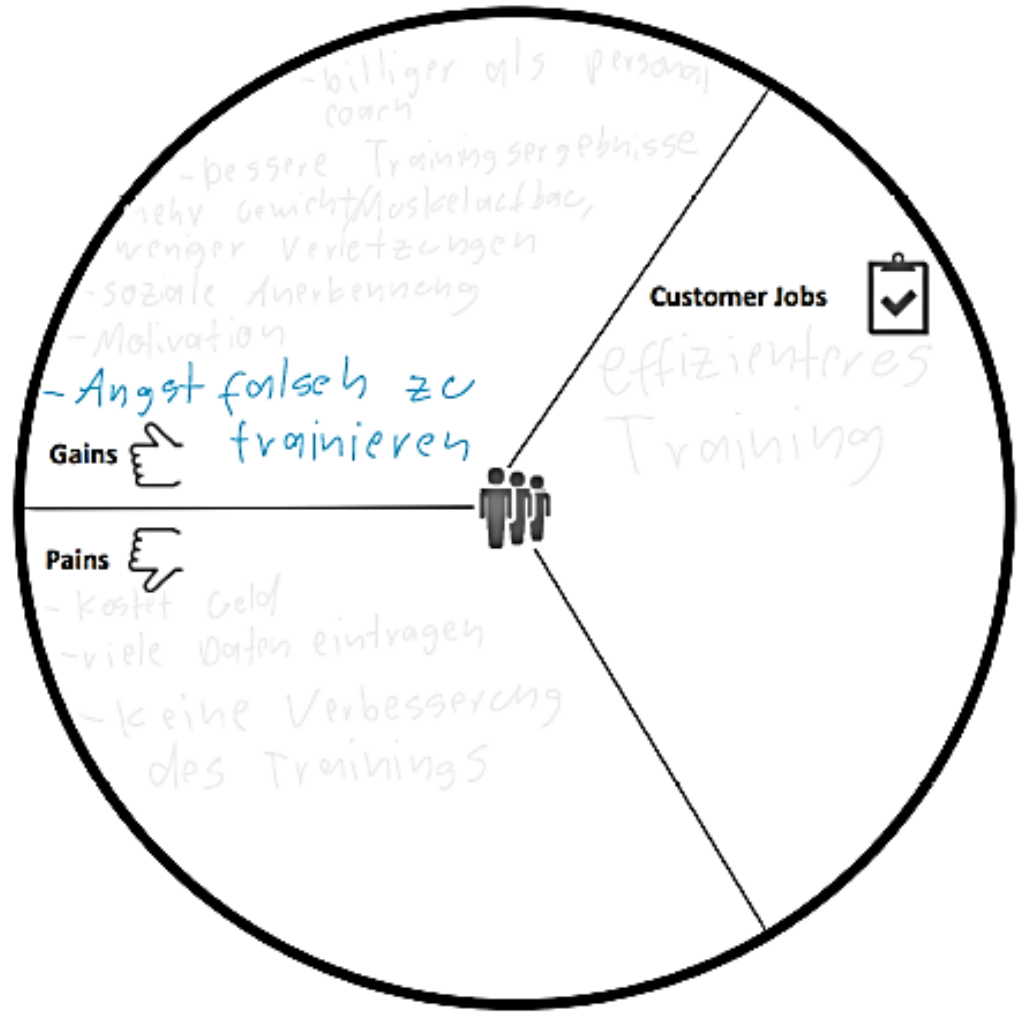

Products
0101010
Gain Creators
Pain Relievers
Gains
Pains
Customer Jobs





* was darf man mit den Daten machen?

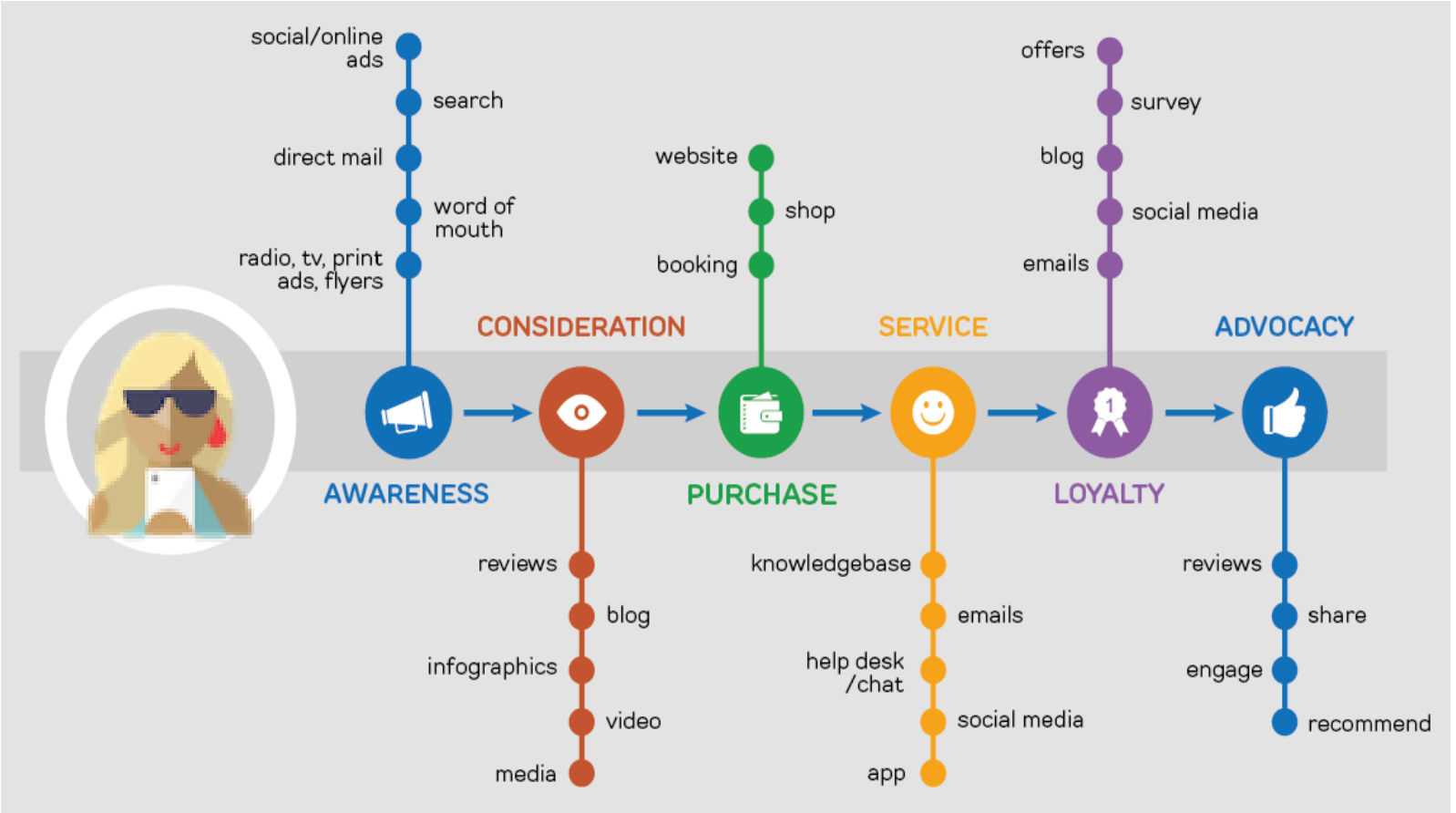

Products
-Videos von Profis mit korrektur Ausführung
Gain Creators
Pain Relievers


Customer Jobs
-Angst falsch zu trainieren
Gains
Pains

Customer Journey

Digital Customer Journey

The customer journey is **the complete sum of experiences that customers go through when interacting with your company and brand**. Instead of looking at just a part of a transaction or experience, the customer journey documents the full experience of being a customer.

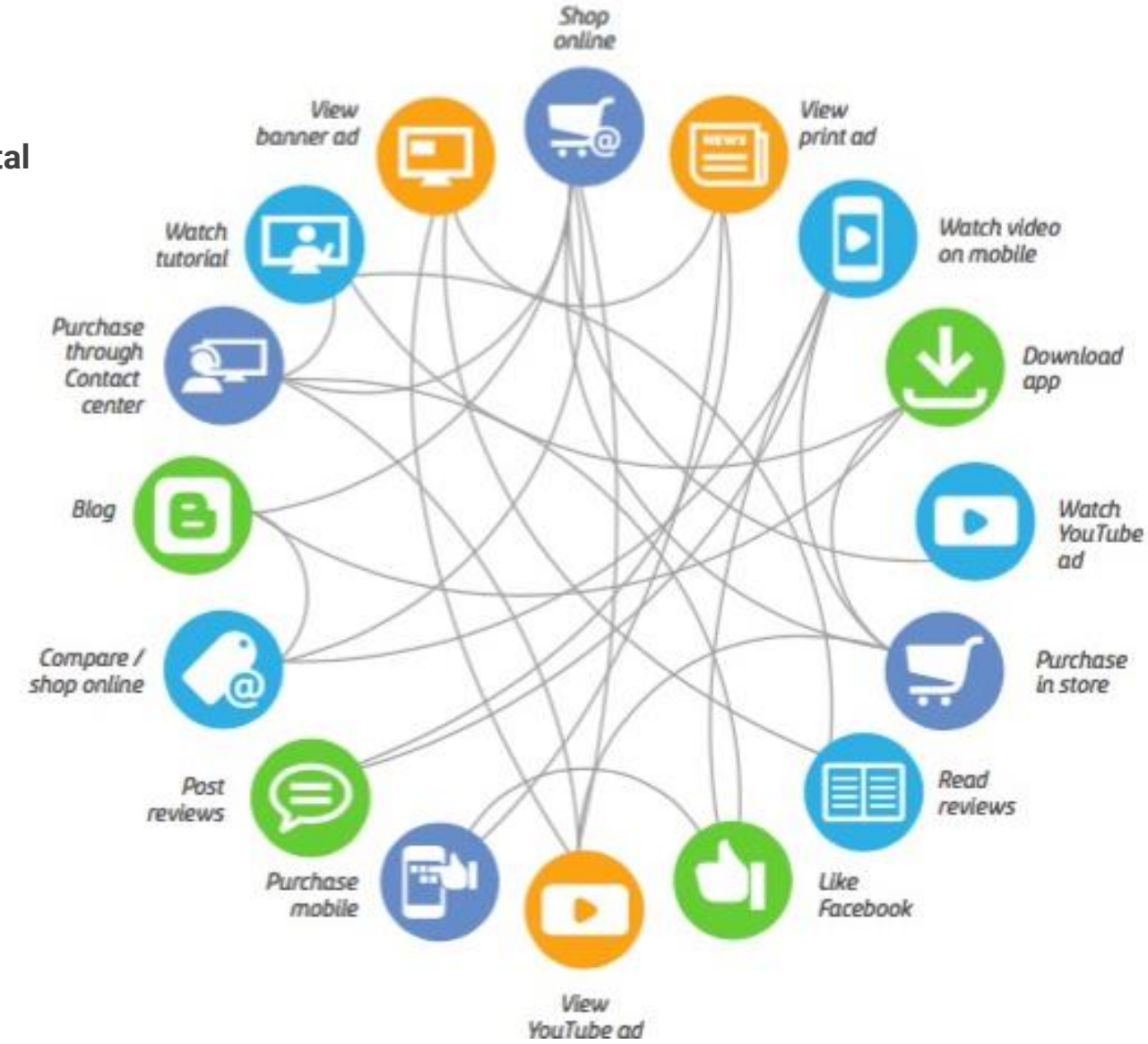


Source: https://www.paldesk.com/customer-journey-mapping-101-the-purpose-benefits-and-positive-outcomes/

Digital Customer Journey

Traditional

Digital



Digital Customer Journey

https://www.youtube.com/watch?v=vbx4KzE4l4oX-aU_T8

Group Work Data & Customer Journey

Group Work

1. **Which role does data play for your business idea?**

- Guiding Questions
  - What kind of data do you need to successful implement your business idea?
  - Which data has to be brought together to bring value to your business idea?
  - Do you want to apply any analytics to bring value to you business idea?

2. Describe a customer journey for your business idea (related to the defined persona before)

1) Welch role does data play for your business idea?

- Forschungsdaten(wissenschaftl. Daten, z.B.,
  - → Papers (Zeitschriftenveröffentl.)
  - → Fachliteratur (z.B. Springer)
  - → Anderweitige Publikationen (z.B. Veröffentlichungen auf Unihomepages)
- Nicht-wissenschaftliche Daten

- Quellen
  - → öffentlich
    - → DESTATIS
    - → Statista
    - → Selbstauskünfte (von Unternehmen)
    - ...
  - → nicht-öffentlich
    - → Marktforschungsunternehmen
    - → Forschungsinstitute
    - → Behördliche Daten
    - ....