Digital Transformation and sustainable business models

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Freitag (ganztags) 20.10.2023 Freitag (ganztags) 27.10.2023	Freitag (ganztags) 03.11.2023 Freitag (ganztags) 10.11.2023	Freitag (ganztags) 17.11.2023 Freitag (ganztags) 24.11.2023	Freitag (ganztags) 24.11.2023	Freitag (ganztags) 15.12.2023
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

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).

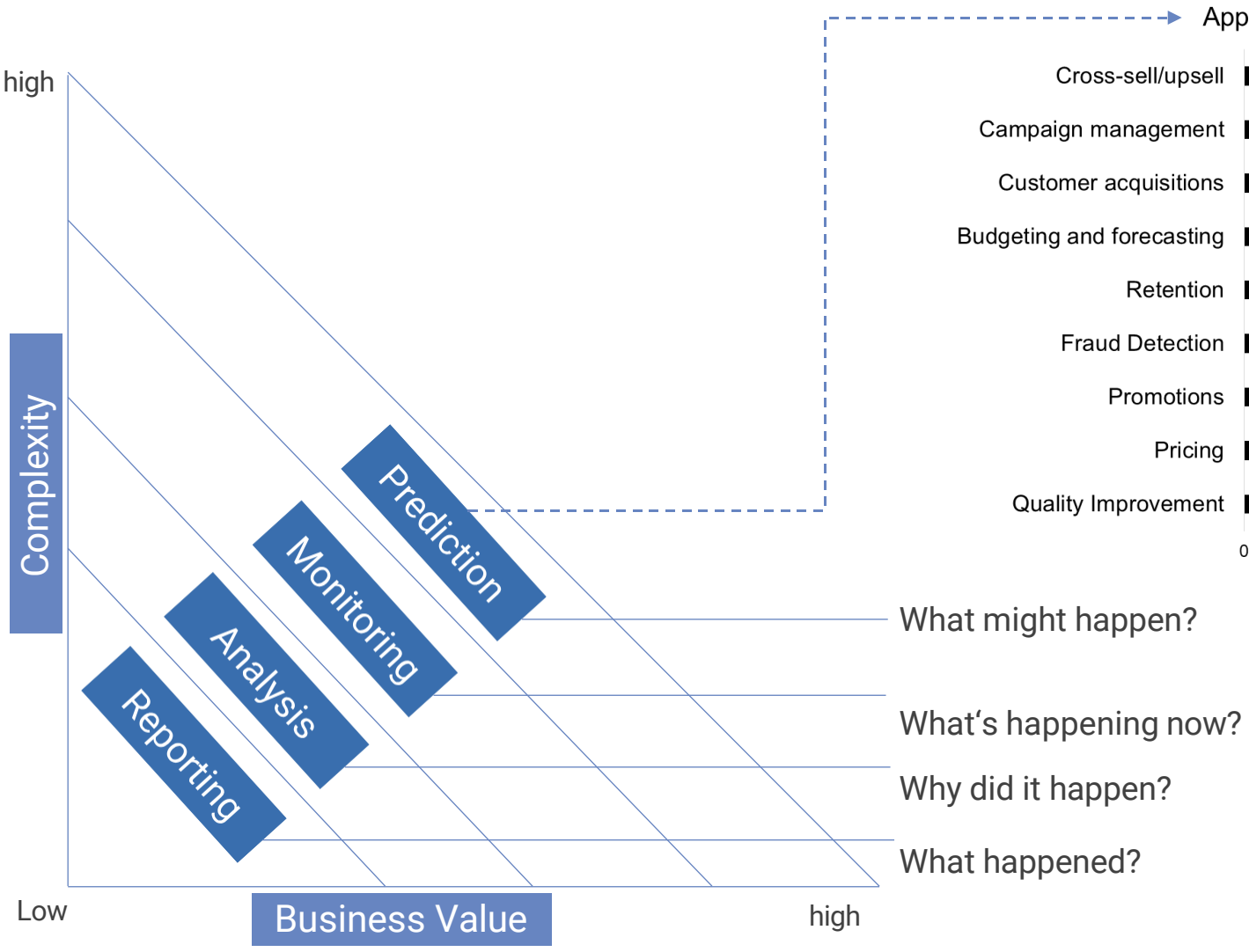
A good and thorough data strategy turns data into value

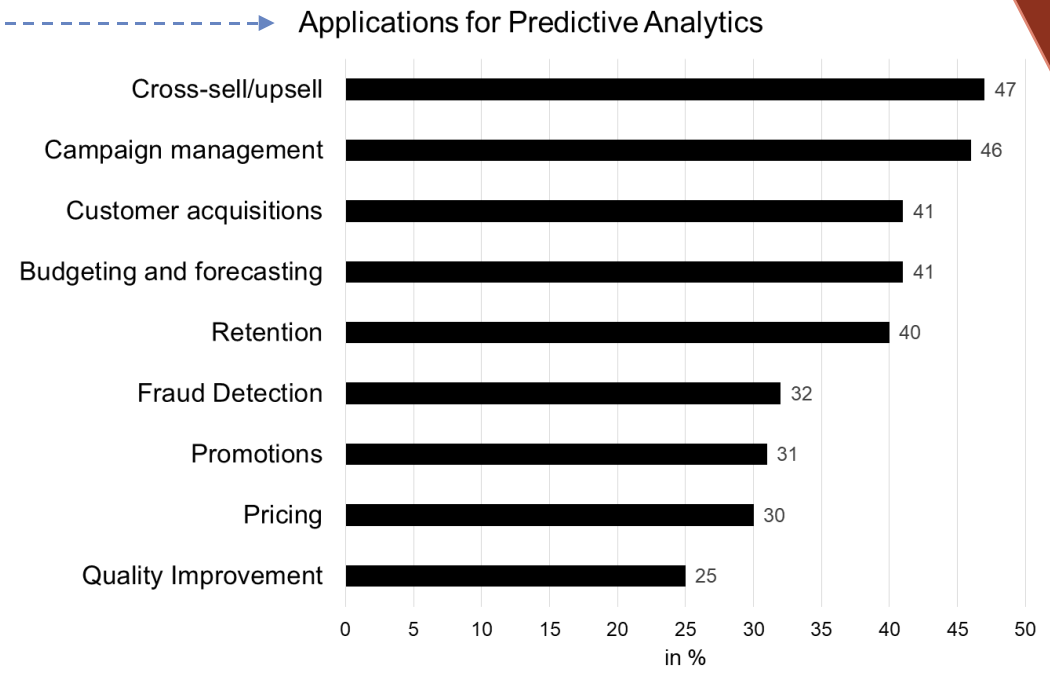
E.g. Link customer data across operational silos to provide better value

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

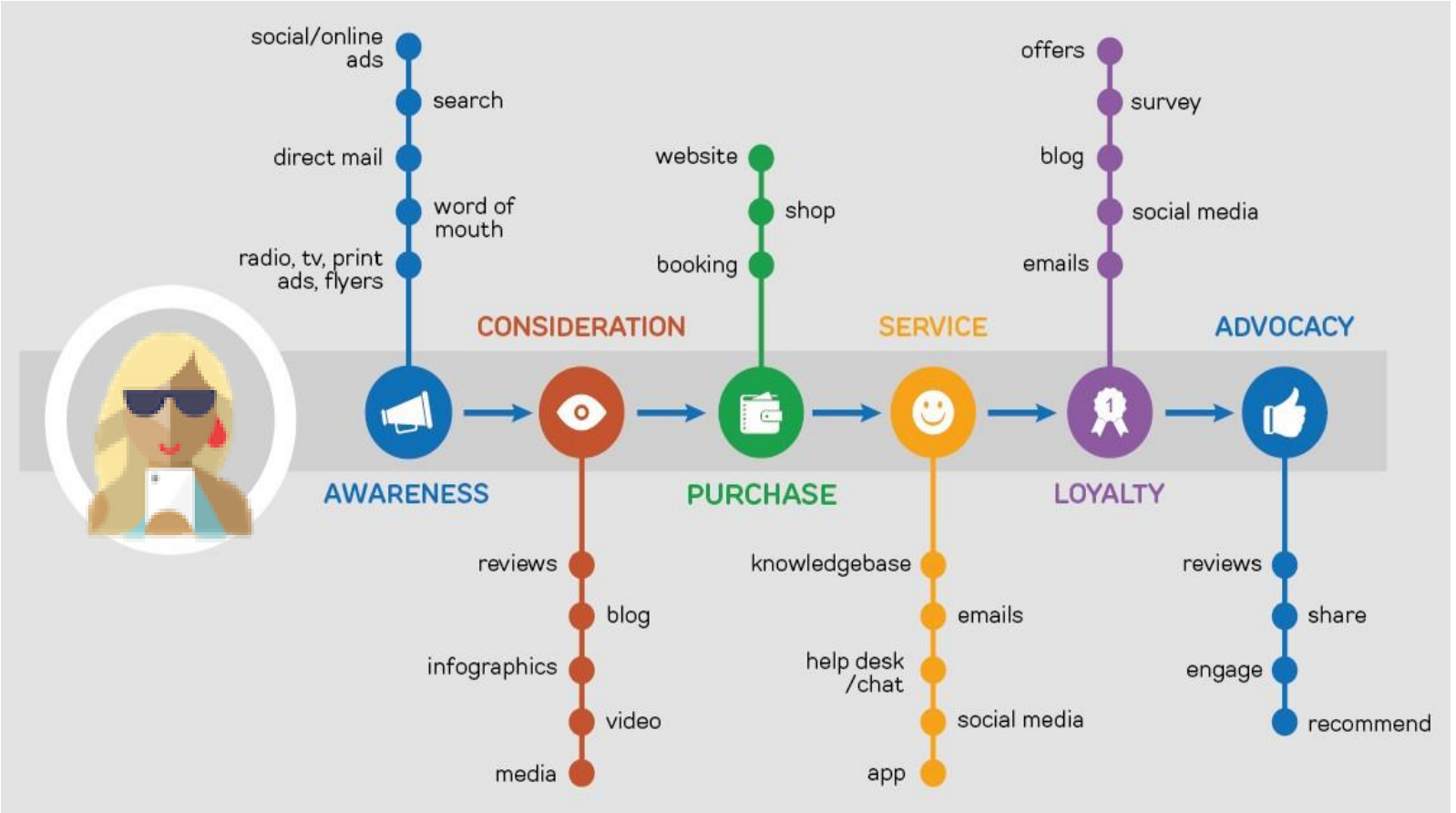
The challenge is to obtain valuable information from data





Digital Customer Journey

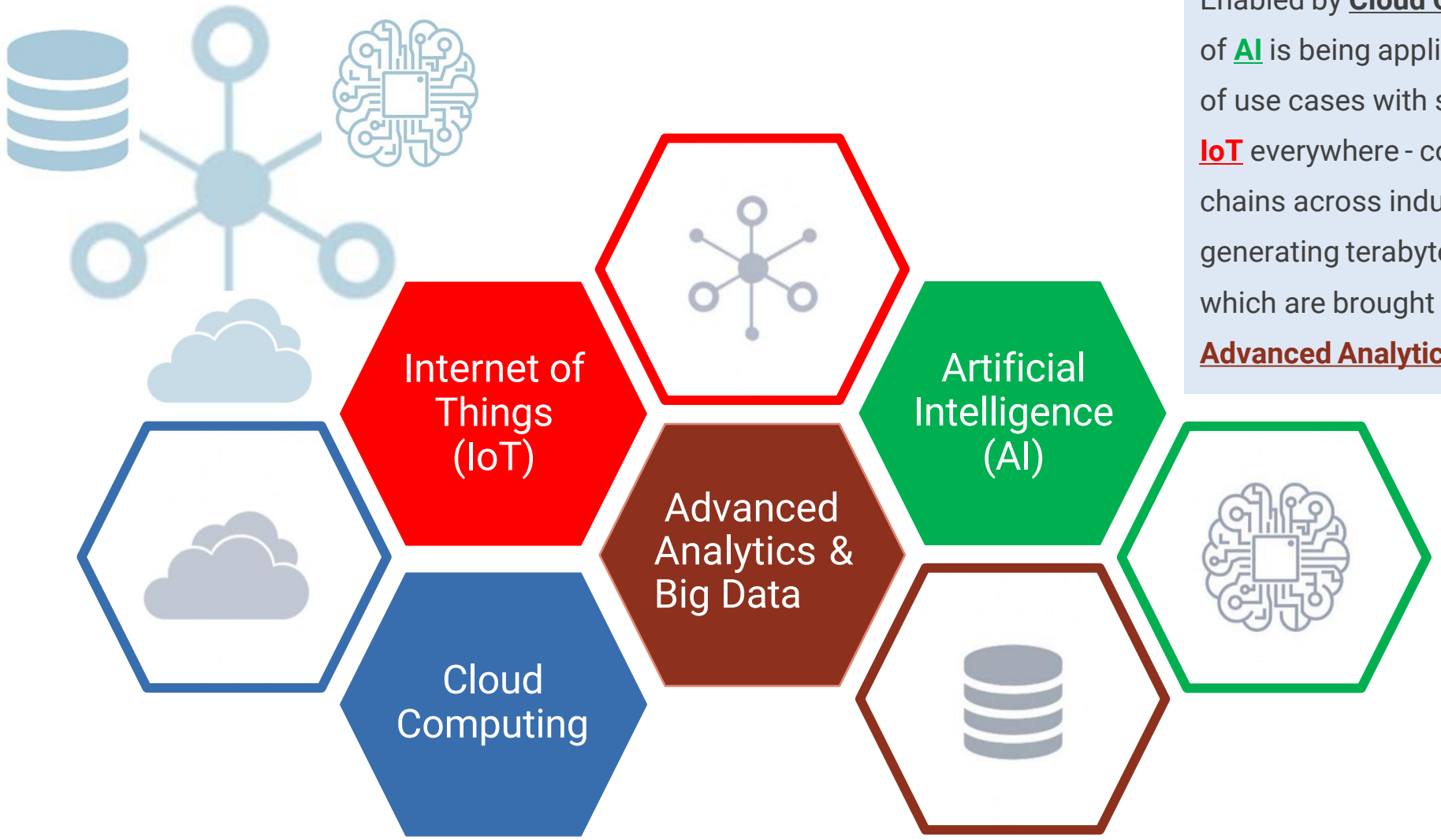
The customer journey is **the complete sum of experiences that customers go through when interacting with your company and brand**. Instead of looking at just a part of a transaction or experience, the customer journey documents the full experience of being a customer.



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

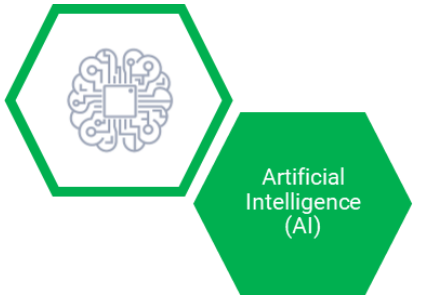
Artificial Intelligence

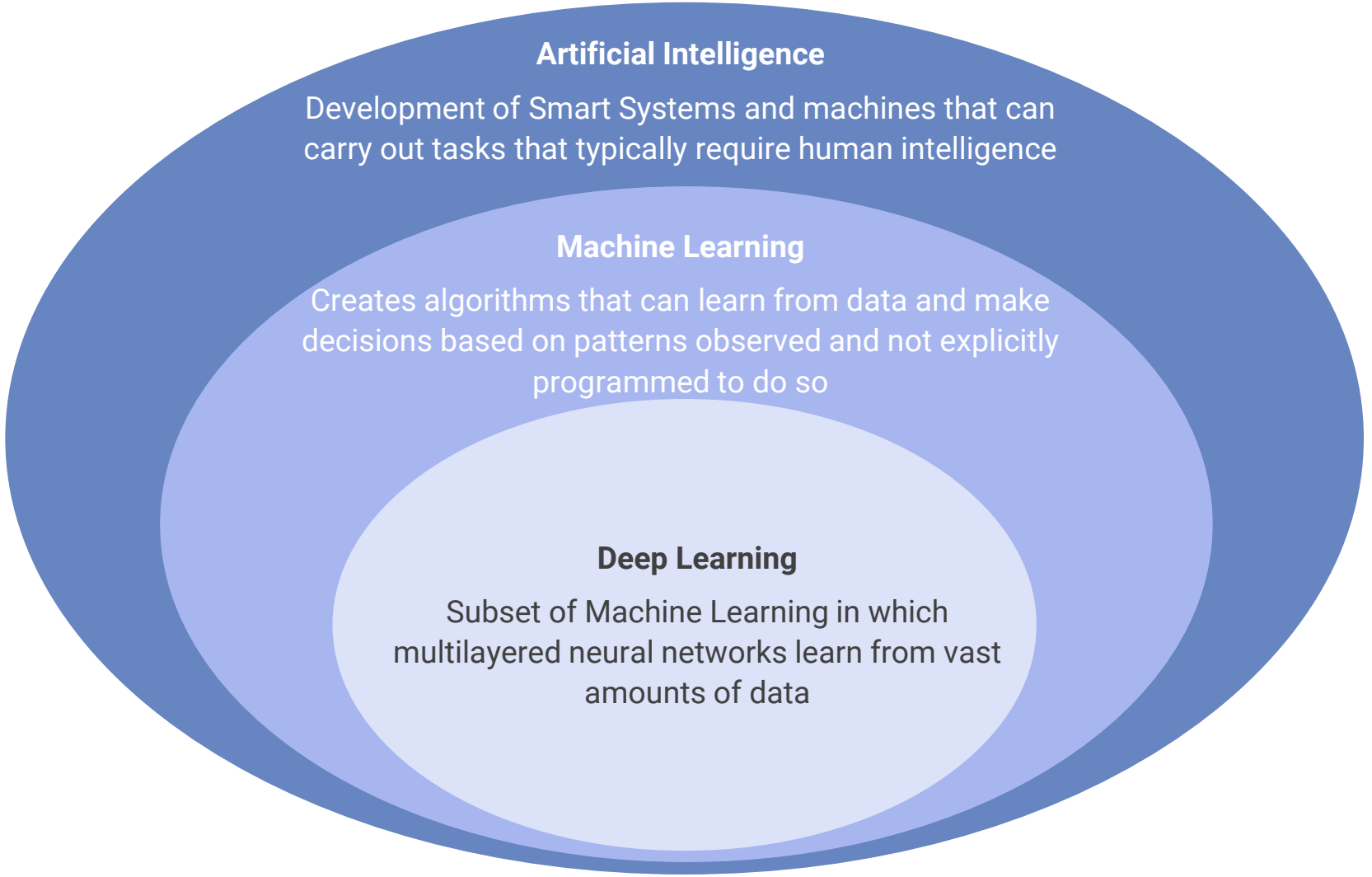
Digital Transformation



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.**

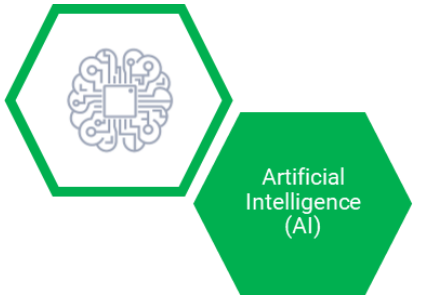
Connection between Artificial Intelligence, Machine Learning and Deep Learning



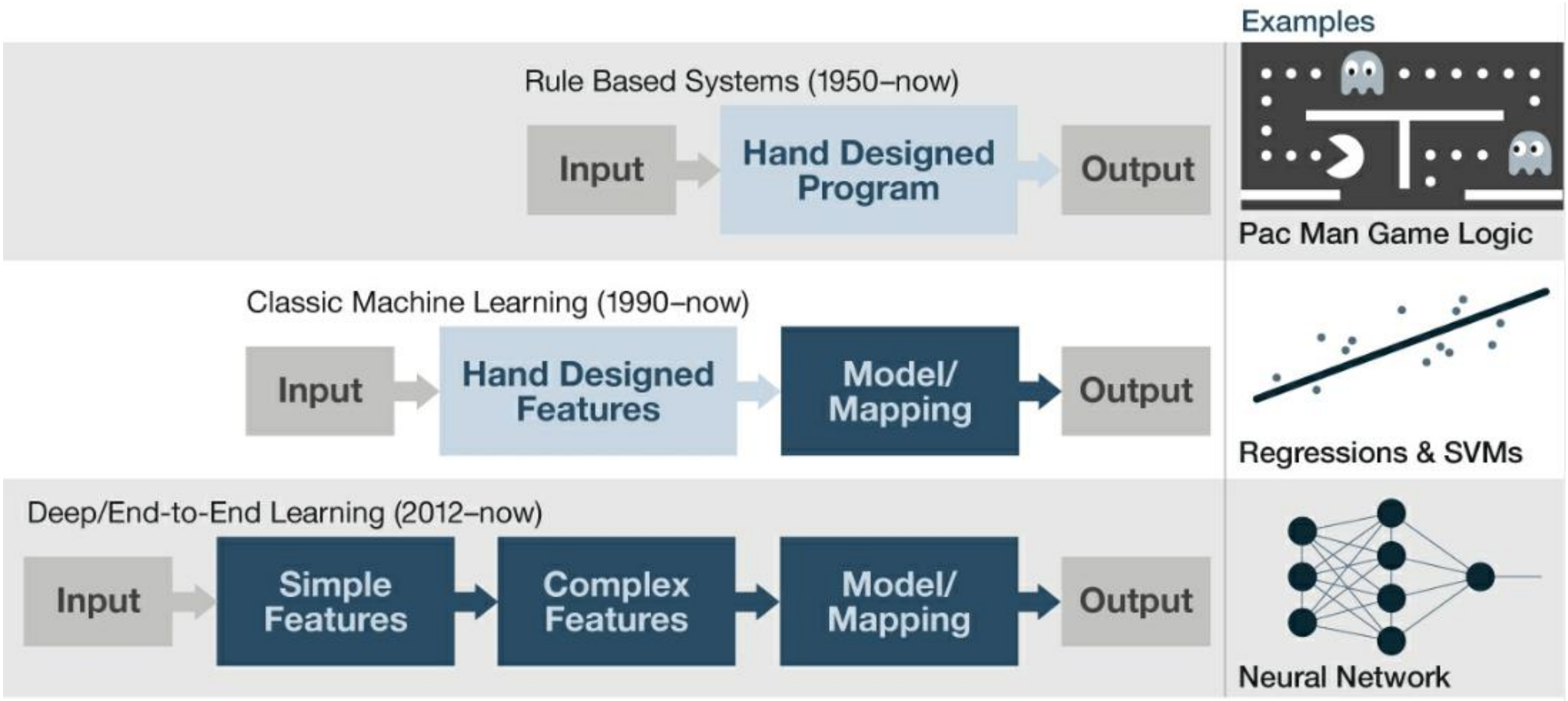


Quelle: https://www.scs.org.sg/articles/machine-learning-vs-deep-learning

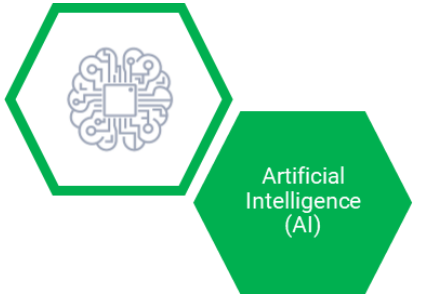
AI Evolution from Rules-Based Systems to Deep Learning



AI has evolved from the rules-based, expert systems approaches that characterized its early days, to today´s advanced deep learning methods that leverage sophisticated neural networks and powerful hardware.



Artificial Intelligence –
the simulation of human intelligence processes by machines



AI programming focuses on 3 cognitive skills:

Learning processes	Reasoning processes	Self-correction processes
This aspect of AI programming focuses on acquiring data and creating rules for how to turn the data into actionable information.	This aspect of AI programming focuses on choosing the right algorithm to reach a desired outcome.	This aspect of AI programming is designed to continually fine-tune algorithms and ensure they provide the most accurate results possible.

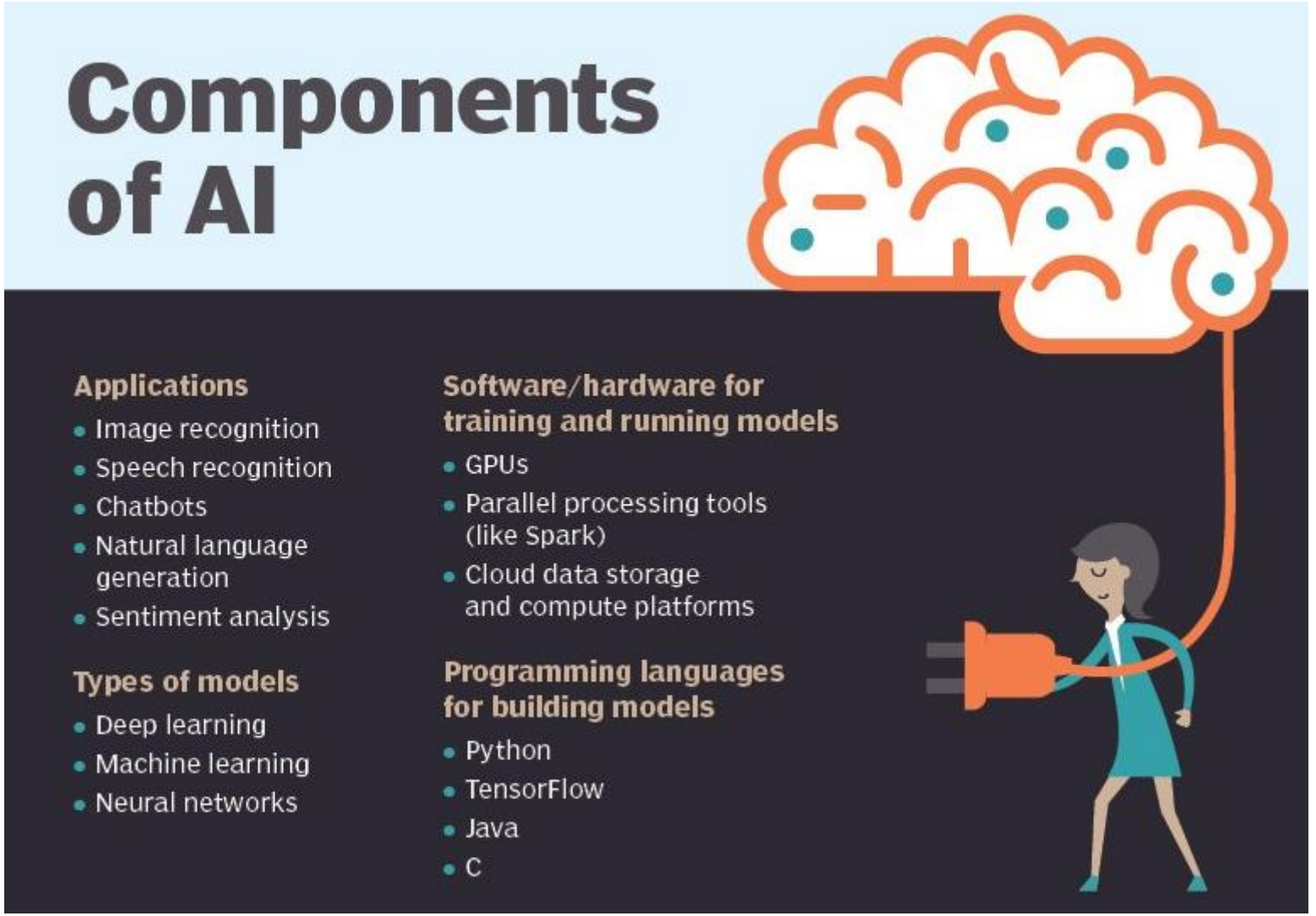
Weak AI (Narrow AI)

... is an AI system that is designed and trained to complete a specific task. Industrial robots and virtual personal assistants, such as Apple's Siri, use weak AI.

Strong AI (artificial general intelligence (AGI))

... describes programming that can replicate the cognitive abilities of the human brain. When presented with an unfamiliar task, a strong AI system can use fuzzy logic to apply knowledge from one domain to another and find a solution autonomously.

Components of AI



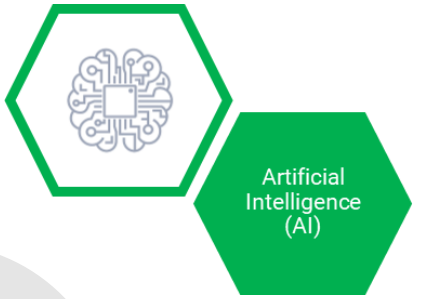
Artificial Intelligence (AI)

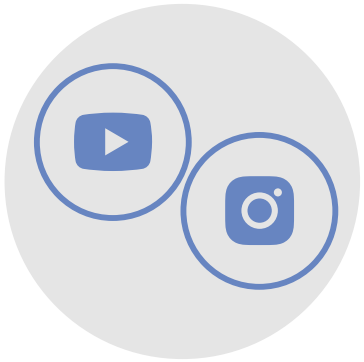
AI requires a foundation of specialized hardware and software for writing and training machine learning algorithms.

No one programming language is synonymous with AI, but a few, including Python, R and Java, are popular.

Quelle: https://www.techtarget.com/searchenterpriseai/definition/AI-Artificial-Intelligence

AI Examples in everyday life





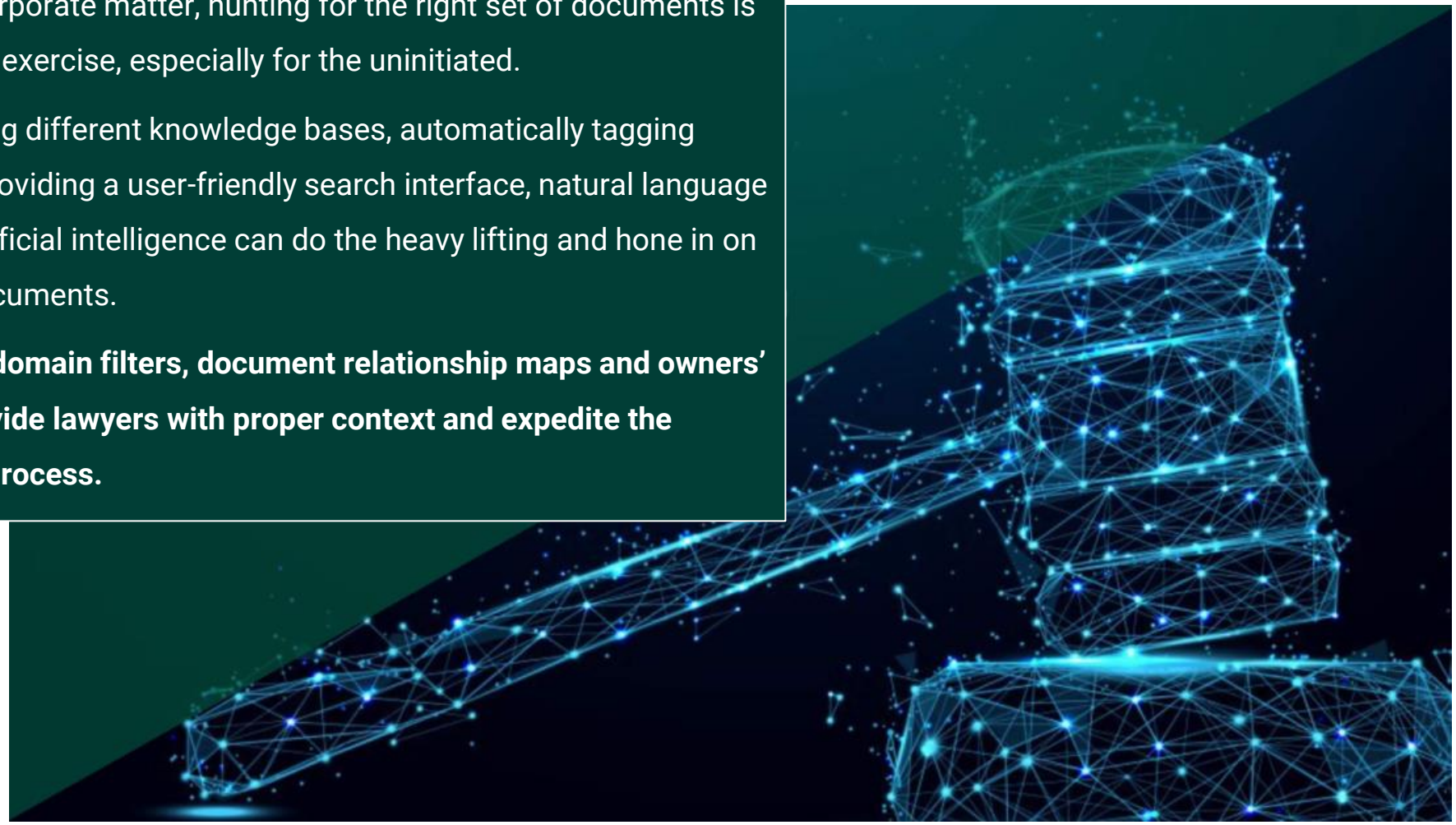
Example: How Law Firms can apply AI in their Business

Artificial Intelligence (AI)

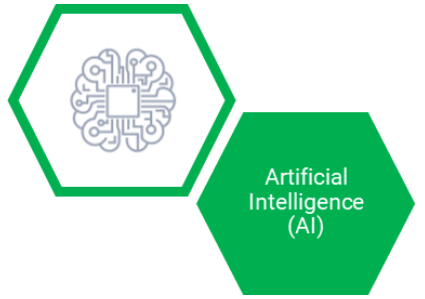
Documents sit across domains, in emails, SharePoints and data servers. Whether performing research for a litigation case, or locating the right precedent for a corporate matter, hunting for the right set of documents is a time-consuming exercise, especially for the uninitiated.

Through integrating different knowledge bases, automatically tagging documents and providing a user-friendly search interface, natural language understanding artificial intelligence can do the heavy lifting and hone in on the right set of documents.

Useful views like domain filters, document relationship maps and owners' contacts also provide lawyers with proper context and expedite the decision making process.



Example: Usage of data for personalized Healthcare Insurance



Pharmacies and Doctors

Mobile Apps and platforms, fitness tracker

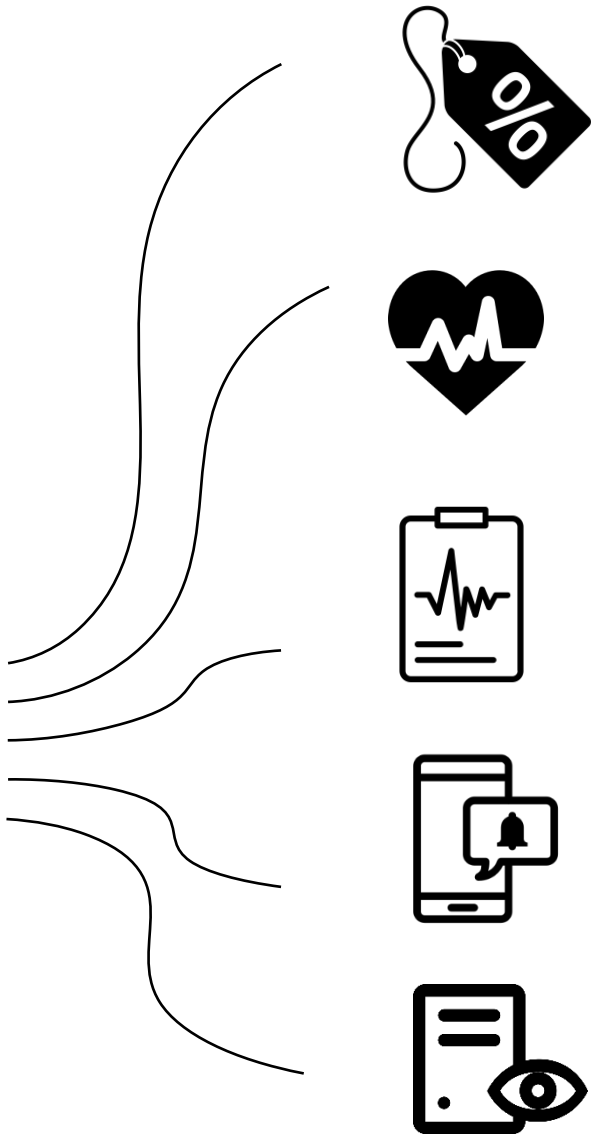
Gyms and associations

Social Media

Existing Customer Records

Aggregate & Analyze Data

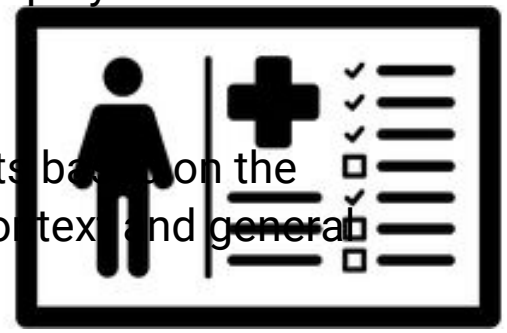
Example: Usage of data for personalized Healthcare Insurance



Calculate discount rate based on health, loyalty or simply the willingness to share data

Predict / recognize diseases to intervene at an early stage based on crowd data

Give customer insight about personal health history and simplify invoice process



Offer relevant benefits based on the customers current context and general interests

Automate insurance verification & fraud detection to lower cost and increase productivity

AI Coughing App (*under construction*) to detect Coronavirus

Cough Tones contain Biomarkers

The researchers relied on acoustic biomarkers, i.e. certain characteristic features in the sounds they had already found in earlier studies in Alzheimer's patients. They then tested what the machines had learned on the remaining 1064 Participants in the study. The results were quite promising. The model achieved a sensitivity of 98.5 percent in subjects diagnosed with COVID-19 infection in an official test.

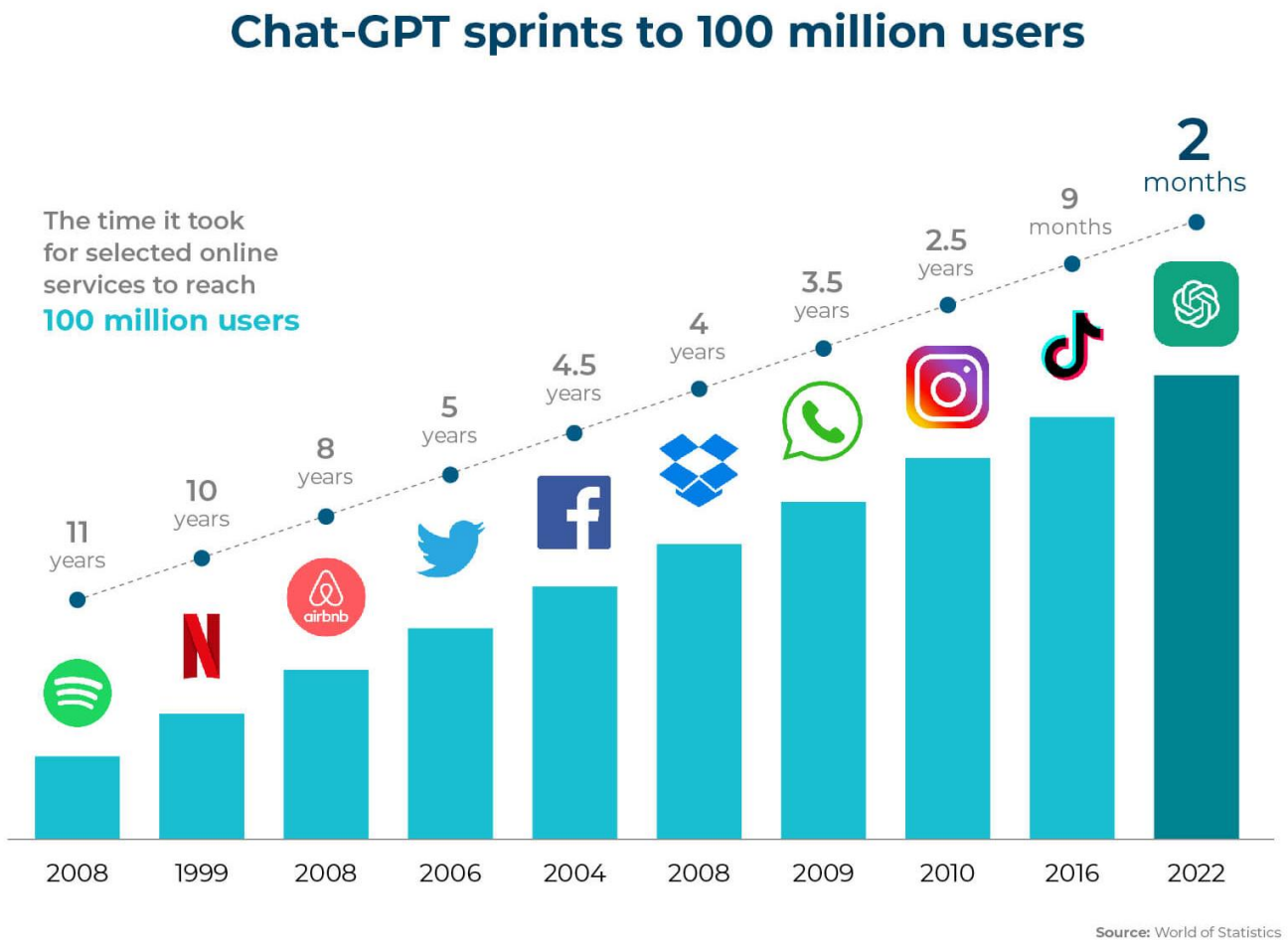
Artificial Intelligence (AI)

Quelle: https://pharmaphorum.com/news/does-my-cough-sound-like-covid-there-could-be-an-app-for-that/

What is ChatGPT?

https://www.youtube.com/watch?v=3ao7Z8duDXc&t=264s

“Gen-AI is the biggest game changer since the introduction of the smartphone”



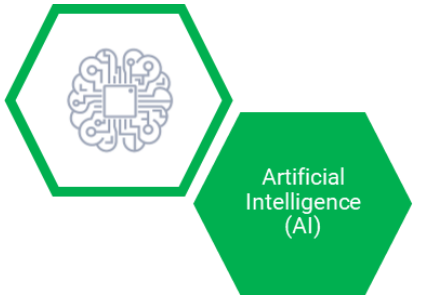
ChatGPT: What's behind the public face of AI?

- Since the end of 2022, ChatGPT has become the public face of AI.
- But how does it work?
- The basic principles behind it are surprisingly simple.
- ChatGPT knows many complex statistical patterns that are latently present in our language.
- Based on these pattern, it has a single task: Given a sequence of text, for example, „The quick brown fox…", the model predicts the most likely next word (technically a token, but that's not important for us) – „The quick brown fox jumps…"
- It repeats this iteratively, one additional word (token) at a time, until it reaches a cutoff or statistically likely stopping point – „The quick brown fox jumps over the lazy dog."

ChatGPT: What does all that imply?

- ChatGPT does not “know” concrete facts. It only knows complex statistical relationships between words and sequences of words. It has no internal access to information from after its last training update.
- Its very nature means that is effectively designed and programmed not to produce output based on ***truth***, but rather based on ***plausibility***.

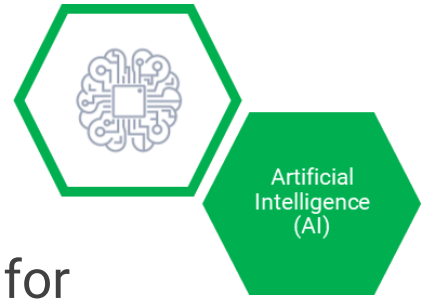
Artificial Intelligence and the Future



https://www.youtube.com/watch?v=wTbrk0suwbg

Artificial Intelligence – Critical View

Deutscher Bundestag



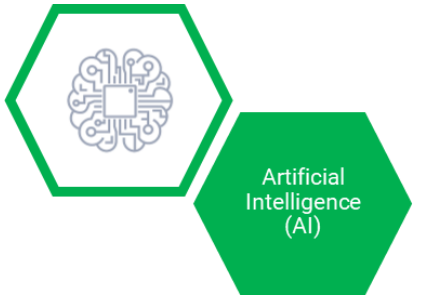
The **German Bundestag** has set up a Commission of Enquiry on Artificial Intelligence for "**Social Responsibility and Economic Potential**".

This Commission presented its final report on **October 28, 2020**:

According to this report, artificial intelligence is the next stage of digitization. Under the guiding principle of "**people-centered AI**", a "**democratic design**" of development is called for, so that AI applications are primarily geared to the well-being and dignity of people and bring social benefits.

In order to prevent discrimination against people, "when AI judges people, it is necessary to have a claim to transparency, accountability and explanation of AI decisions, so that a judicial review of automated decisions is possible.

The EU Artificial Intelligence Act



EU-weite Regulierung des Einsatz und Entwicklung Künstlicher Intelligenz in allen Lebensbereichen

Regulierung entsprechend der Einteilung in Risikoklassen

Inakzeptables Risiko

Anwendungen mit klarer Bedrohung der Menschenrechte, z.B. Gesichtserkennung im öffentlichen Raum oder Sozialkreditsysteme (China), grundsätzlich verboten

Hohes Risiko

Gefährdung der Gesundheit, Sicherheit und Grundrechte von EU-Bürgern, z.B. biometrische Systeme, Betrieb kritischer Infrastrukturen, Personalsoftware (Bewerbungen)

Begrenztes Risiko

Anwendungen in unkritischen Bereichen, z.B. Chatbots, unterliegen Transparenzpflicht → Nutzer sollen, wissen, dass sie mit einem System interagieren

Minimales Risiko

Anwendung mit sehr geringem Risiko, z.B. Computerspiele, Filmempfehlungen, Spamfilter, keine Einschränkung durch Verordnung

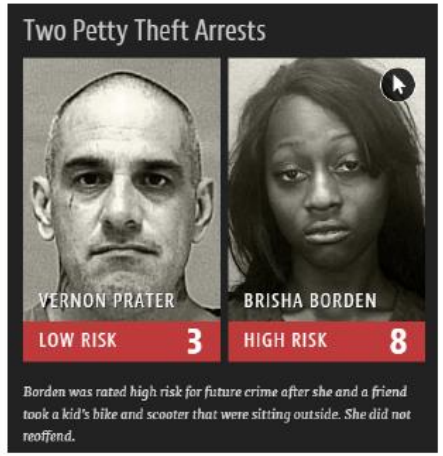
Quelle: https://www.handelsblatt.com/technik/it-internet/eu-regulierung-kuenstliche-intelligenz-wirtschaft-warnt-vor-massiven-einschraenkungen-durch-ai-act/28850684.html

Bias Stories – Unfair Consequences on Real People

Artificial Intelligence (AI)

Apple Credit Card

Correctional Offender Management Profiling for Alternative Sanctions (COMPAS)



Joy Buolamwini, Face Recognition Bias

US Case: https://becominghuman.ai/data-and-technology-dont-change-your-culture-they-reveal-it-6ca983074755

Spanish Case: Criminal profiling via facial recognition at a major retailer

UK Case: A-Levels AI 'substitute' algorithm during first Covid-19 wave

Quelle: https://news.mit.edu/2018/study-finds-gender-skin-type-bias-artificial-intelligence-systems-0212

Key Trust Factors for Artificial Intelligence

Artificial Intelligence (AI)

Processes and Roles

- Tailoring to AI Governance
- Accountability
- Human Agency and Oversight

Fairness

- Diversity, non-discrimination and fairness
- Avoidance of unfair bias
- Stakeholder participation

Robustness

- Technical Robustness and Safety
- Resilient and secure AI systems
- Accurate, reliable, reproducible

Transparency

- Explainability
- Communicate data, system and business model involved

Society and Environment

- Societal and environmental wellbeing
- Promote solving social issues

Privacy and Data Governance

- Protecting privacy and data
- Adequate data governance mechanisms

Approach towards Trustworthy AI

Artificial Intelligence (AI)

1 2 3 4

Phase 1: Design und Konzeption

1 / Assessment

- Identifikation von AI Risiken
- Assessment von AI Risiken
- Transformationsbegleitung

2 / Analyse

- Fairness Testing
- Explainability Testing
- Robustness Testing

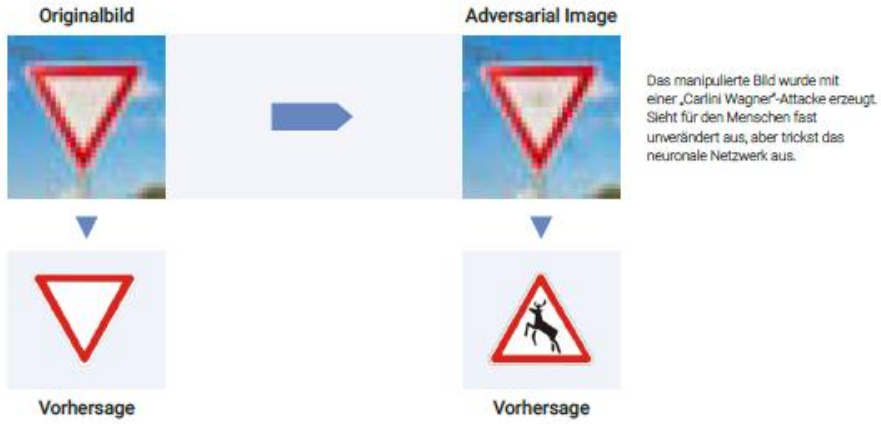
Phase 2: Service und Betrieb

3 / Action

- Risikomitigierung
- Roadmap und Implementierung

4 / Iteration

- Monitoring & Alerting
- Incident Response
- MLOps



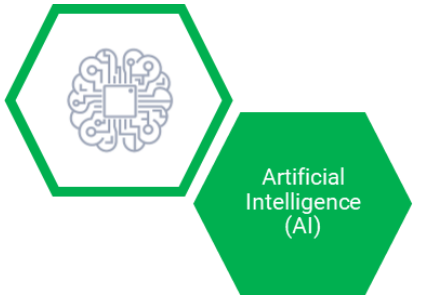
Manipulation of image data

Generate pictures based on a certain statement

A cute dog and a cute cat playing together

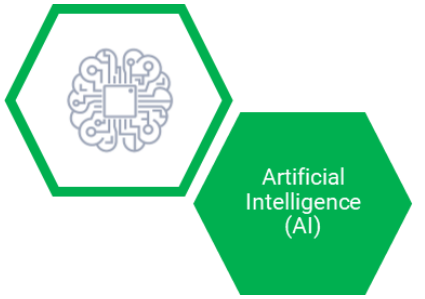
https://labs.openai.com/e/ZjOi3Lr6dqNEahwxQ5fVrqeM

AI Examples:



- Search engines facilitate the handling of the flood of information available on the Internet
- Expert systems are used in the exploration of oil wells, the control of Mars robots or medical diagnosis
- Machine translation is widely used. Examples: Google Translator, DeepL
- Text recognition and text generation, e.g. for breaking news, advertising or for particularly structured data
- Data mining and text mining offer methods for extracting core information from unstructured or only weakly structured texts
- Analysis and prognosis of stock price developments are occasionally supported by artificial neural networks
- Optical character recognition reads printed texts reliably
- Handwriting recognition is used millions of times in devices such as PDAs, smartphones and tablet computers
- Information retrieval aims at retrieving and merging already existing, complex structures in large data sets, one field of application is Internet search engines
- Speech recognition enables voice control or dictation of a text. It is used in smartphones such as Siri, Google Assistant, Amazon Echo and others
- A knowledge-based system or, more specifically, an expert system provides solutions for complex problems. Examples for such applications are: The computer program Watson (see above) or the knowledge database Cyc. In a simpler form, this is used in smartphones such as Siri, Google Now, Cortana and Samsung's S Voice or Amazon Echo
- Face recognition, e.g. the FindFace app
- Deepfakes, i.e. the exchange of faces or other media content
- Image recognition, e.g. the automatic tagging of images on Flickr or the Cloud Vision API from Google
- Computer algebra systems, such as Mathematica or Maple, support mathematicians, scientists and engineers in their work
- Computer vision systems monitor public places, production processes or secure road traffic
- In computer games, the algorithms developed in AI are used to make computer-controlled players act intelligently
- In group simulations for security planning or computer animation, the most realistic behaviour of (human) masses is calculated
- Semantic search engines, like Wolfram Alpha
- Self-propelled vehicles, e.g. Google Driverless Car
- Intelligent Personal Assistant (or Digital Language Assistant)
- Humanoid robots, e.g. Atlas, ASIMO, Pepper
- Bots, especially social bots (e.g. cleverbot), Chatbot
- Autonomous weapons

Group work: Apply AI to your idea



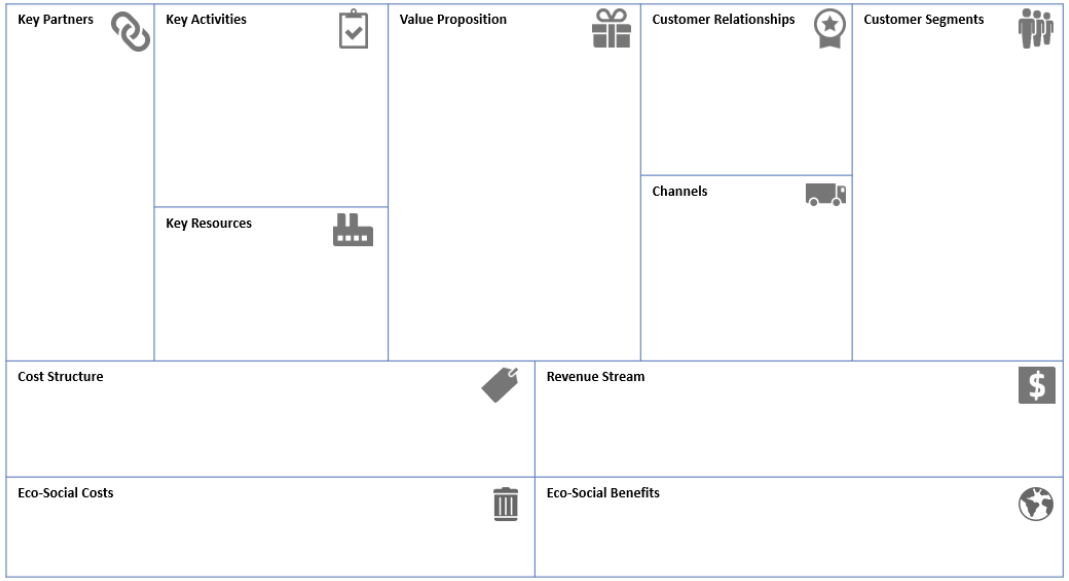
1. Based on the persona created in last block, create a Value Proposition Canvas for your key persona (Customer Jobs, Pains & Gains)
2. Having your general idea in mind: fill the left side of the VPC and think about AI solutions that could satisfy your persona and releases her pains

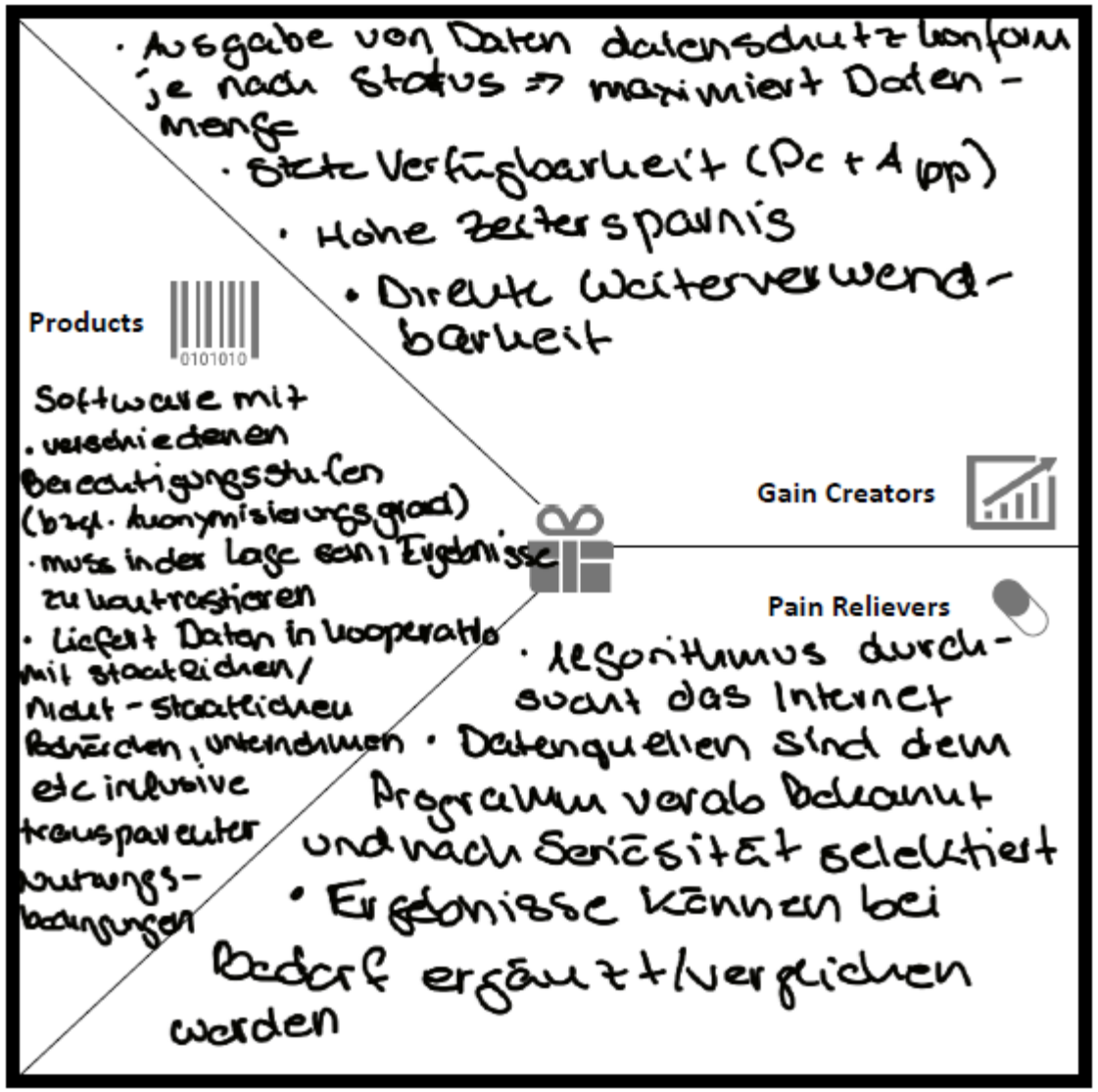
Group Work: BMC

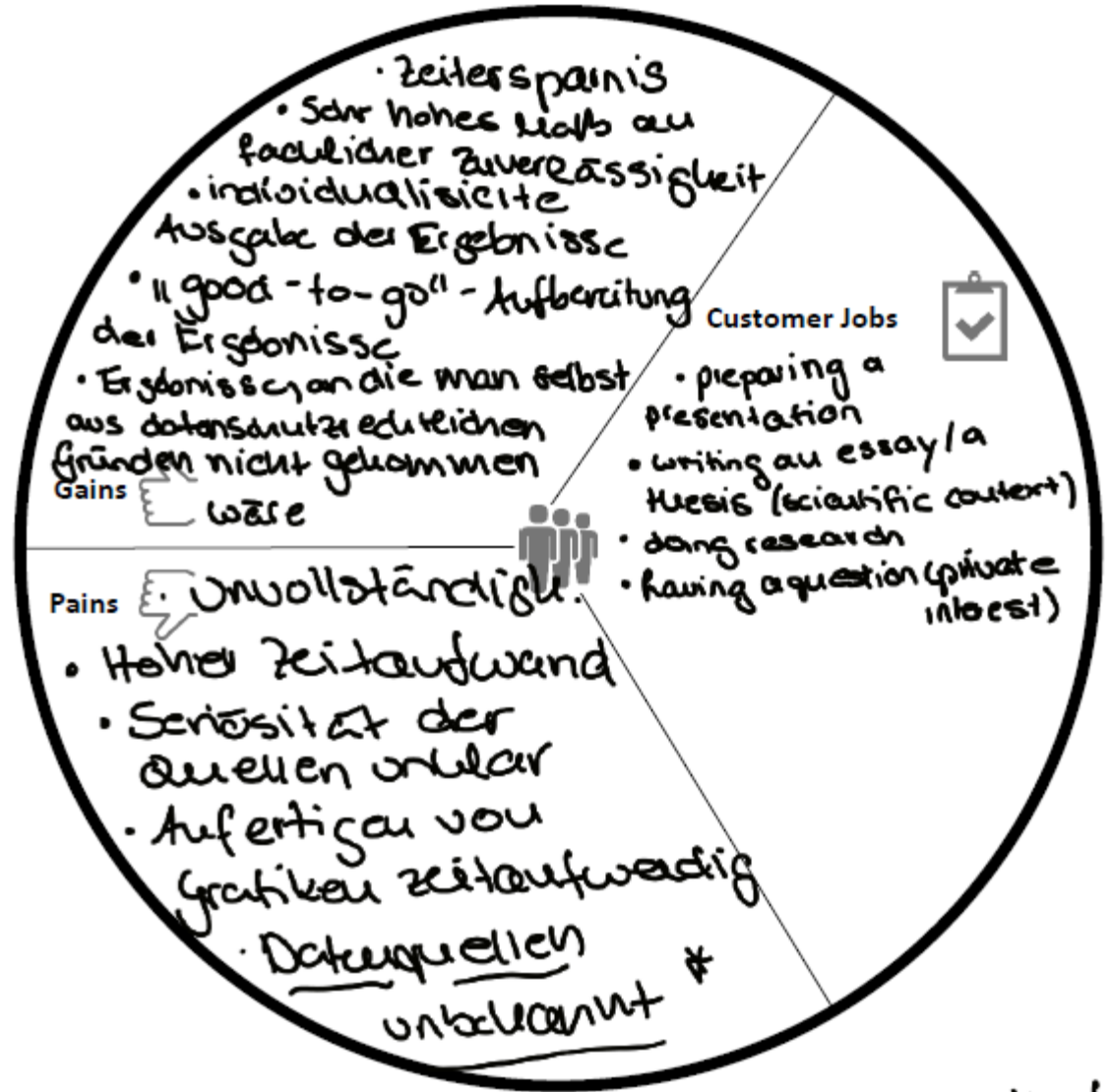
1. Describe the BMC of your idea (high-level)

~30 minutes

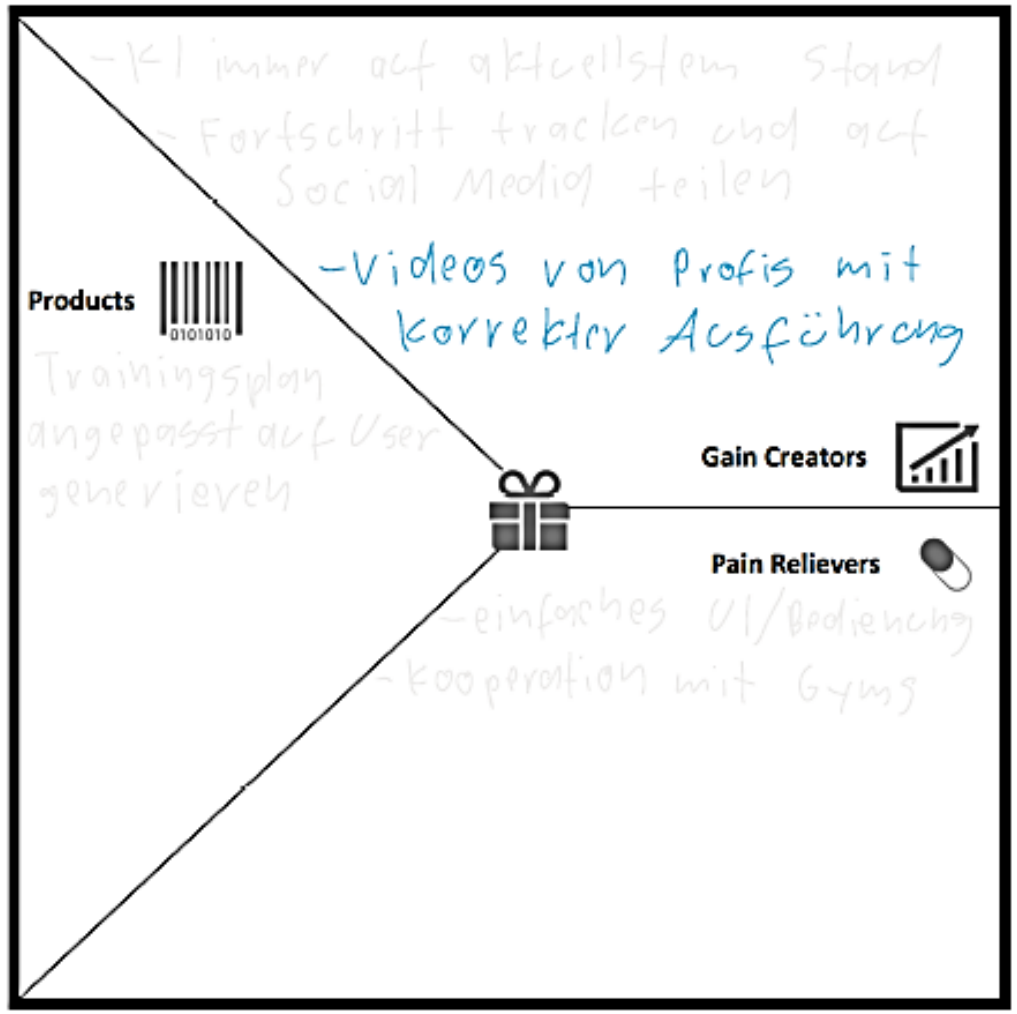
Detailed description will be done independently in each group for the exam – but you need to have basic understanding in group about idea

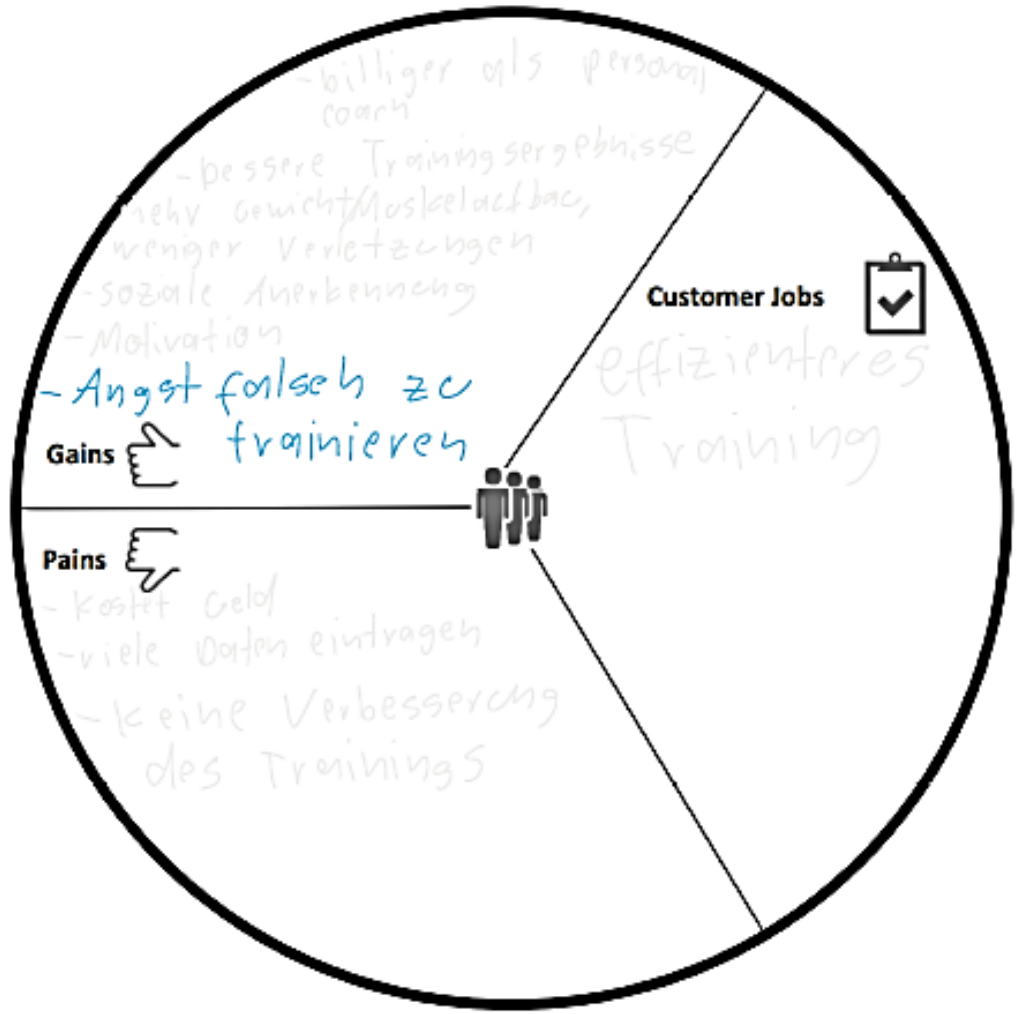






* was darf man mit den Daten machen?


Products
Gain Creators
Pain Relievers


Customer Jobs
Gains
Pains

Key Partners

- Bildungseinrichtungen
- (Warut-)Forschungsinstitute
- Datensammler
- wie Google

Key Activities

Revenue Streams:
Abo-Einnahmen
- Stete Erreichbarkeit bereitstellen
- aquieren Partnerschaften aufbauen
- Algorithmen (weiter-)entw. für z.B. Seriösität

Key Resources

- Cloud-basiert
- Programmierer
- Qualitätssicherung / Datenauswertung (Kundenzufriedenheit)

Value Proposition

- Bearbeitete Daten
- Datenauswertungen
- Grafiken
- Datenvergleiche

Values:
- Zuverlässigkeit
- Seriösität
- Neutralität

Probleme:
- zu viele Quellen verfügbar
- Fehlende Statistikkenntnisse
- Datenschutzrechtliches

Customer Relationships

- Abomodell = Grund v. Kostenlos
- Kundenbindung variabel

Werbekanäle:
Social Medien
Werbung an Schulen und Hochschulen und spezieller Angebote

Channels

- Website im Fokus
- App
- Ziel: Kunden speichern die Seite als Lesezeichen

Customer Segments

- Bildungswesen: (Hoch-) Schulen, VHS, ...
- Informations- / Dienstleistungssektor → Berufstätige
- Forschende
- Privat Interessierte

Cost Structure

- (Forschung) & Entwicklung
- Personalkosten
- Storage von Daten

Revenue Stream

Zuverlässigkeit, Seriösität, Zeitersparnis

Eco-Social Costs

- CO2-Ausstoß für Speicher und Nutzung => Neutralisationskonzept einbinden

Eco-Social Benefits

- Weniger physische Medien notwendig
- Suchzeit verkürzt
- "Analysezeit" verkürzt
- gesparte Wege

=> geringer CO2-Ausstoß

Key Partners (8)

- Studios
- Lebensmittelunternehmen
- Marktforschungsinstitute & Unternehmen
- Hersteller von IoT (Smart Watches, ...)

Key Activities (7)

- App Entwicklung
- KI-Training
- Produkt bewerben
- ↳ Kontaktaufbau mit potentiellen Partnern

Key Resources (6)

- Kundendaten
- Trainiertes KI-Modell
- App
- Mitarbeiter (Entwickler)
- Partnerunternehmen

Value Proposition (2)

- Effizienteres Training
- Grundlegende Einführung und weiterführende Unterstützung beim Erreichen von persönlichen Zielen
- Verbesserung von körperlicher Gesundheit
- Ersparnis von Geld & Zeit
- Verletzungsprävention

Customer Relationships (4)

- Abo-Modell
- Push-Benachrichtigungen
- Freunde einladen (Vorteile für beide)
- Kooperationen mit Studios

Channels (3)

- App
- Kooperationen mit Fitnessstudios und Marken (Essen)
- Print / Onlinewerbung

Customer Segments (1)

- Sport- und Gesundheitsinteressierte Personen
- Alter 18 - 50
- Technische Affinität

Cost Structure (5)

- Softwareentwicklung (KI-Training)
- Mitarbeiter (Verwaltung, Vermarktung)
- Datenankauf
- Cloud Dienstleistungen (Rechenzentren)
- Werbekosten

Revenue Stream (5)

- Abonnements
- Premium Version (Tracking der Übungsausführung)
- Partner (Kooperationen (Koro Drogerie)

Eco-Social Costs (10)

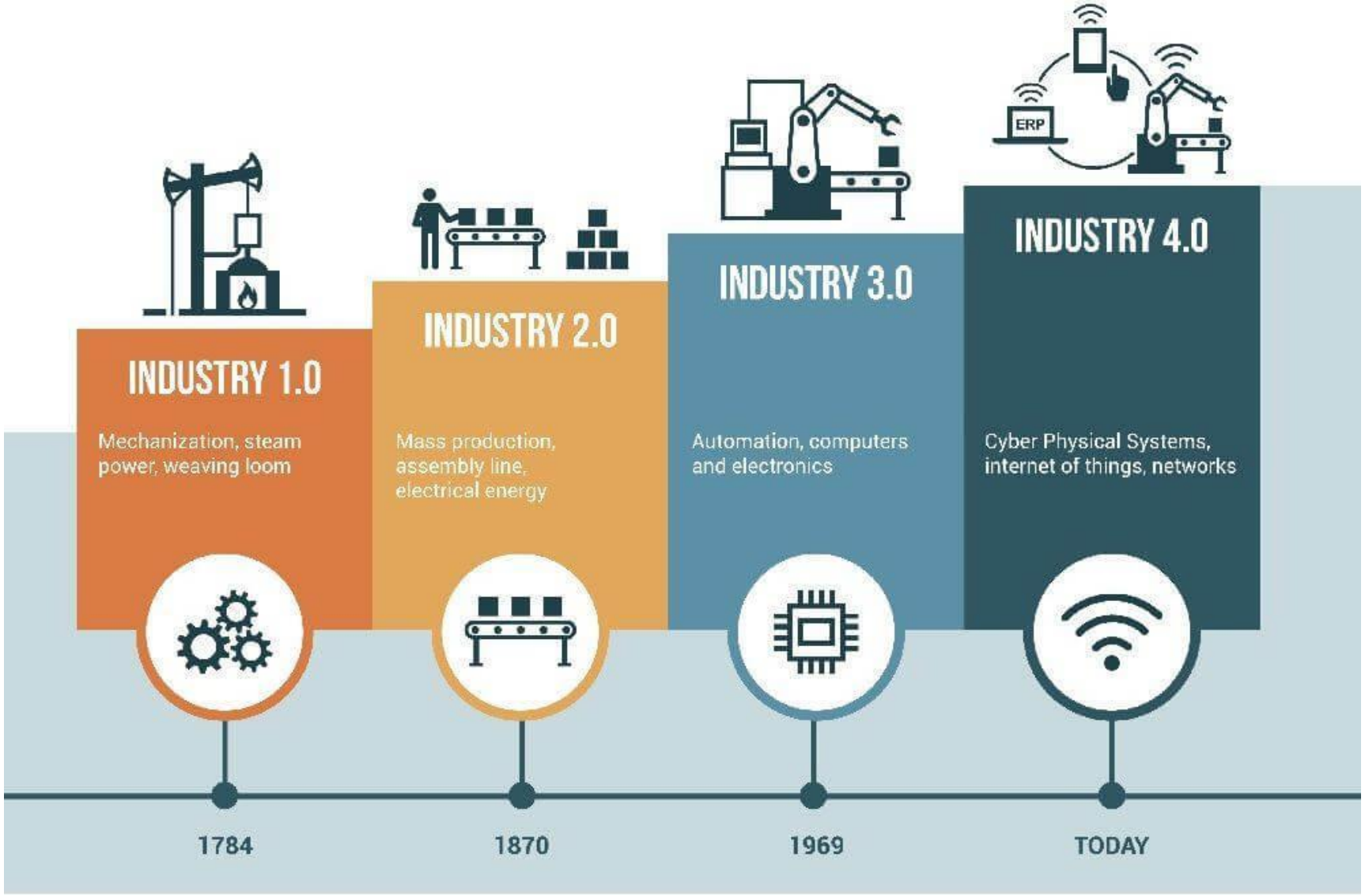
- Disruptive Wirkung auf Personal Training
- CO_2 Ausstoß durch Rechenzentren

Eco-Social Benefits (11)

- Besseres Zeitmanagement
- Weniger CO_2 Ausstoß durch ausgewählte Partner, die bestimmte Produkte anbieten (Umweltfreundlichkeit)
- Verbesserung der Gesundheit

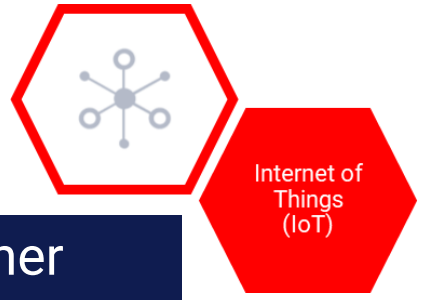
IoT & Ecosystems

IoT as integral part of the industry 4.0



Source: https://www.desoutter.de/industrie-4-0/news/459/industrielle-revolutionen-von-industrie-1-0-zu-industrie-4-0

Internet of Things - Key aspects



Network of physical objects which are equipped with sensors, software and other technologies to connect them with other devices and systems via internet with the goal to exchange data.

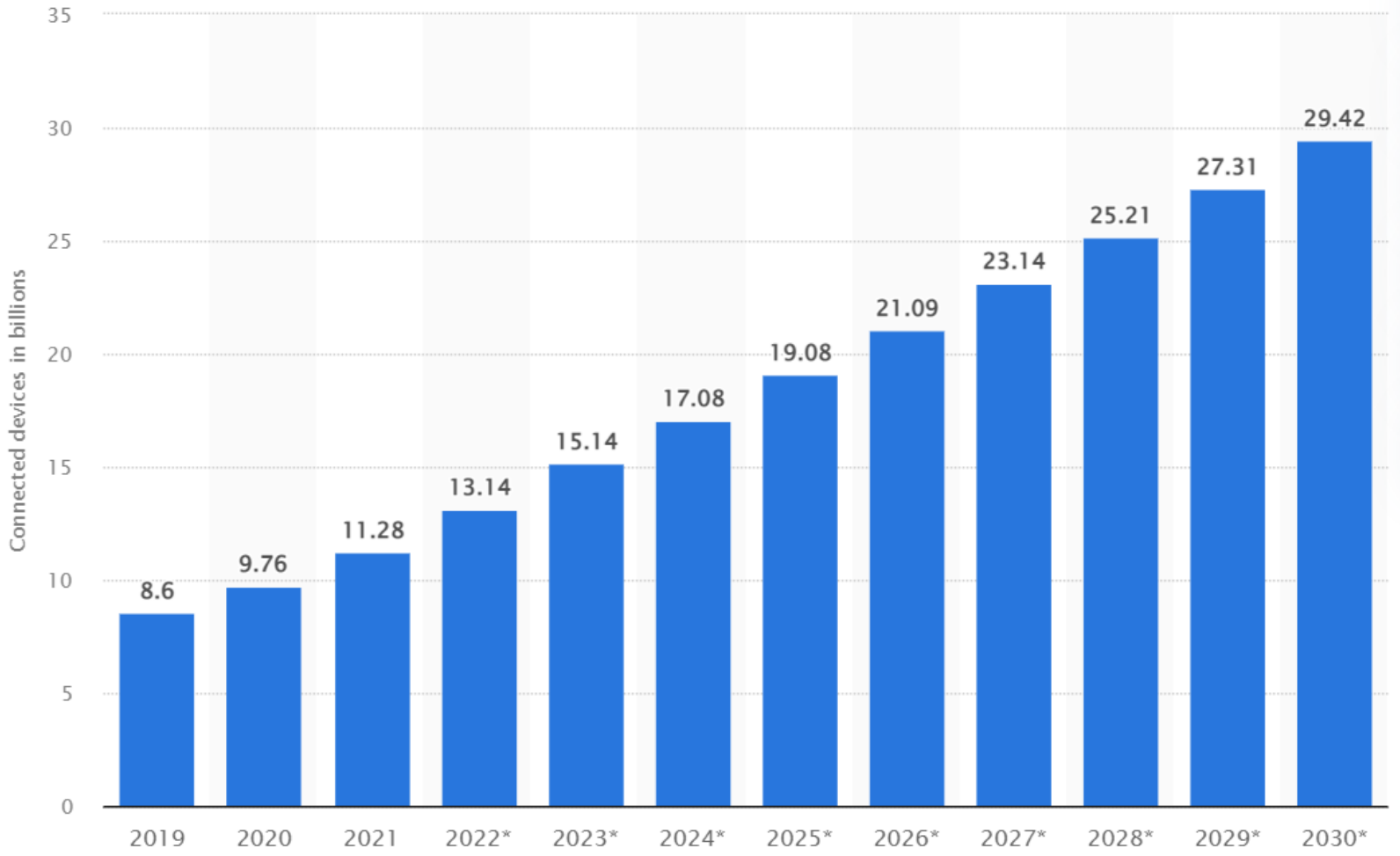
IoT is enabled by and complementary to:

- Cheap Sensor Technology with low energy consumption
- Connectivity – Network protocols for internet enable connection of sensors with cloud
- Cloud Computing – Easy and cheap access to needed infrastructure
- Machine Learning & Analytics – Enables even more possibilities for IoT and IoT itself generates massive amount of data to be used for analysis
- Artificial Intelligence for Voice Recognition/Functions: - Processing of natural language by IoT devices

Source: https://www.oracle.com/de/internet-of-things/what-is-iot/#why-is-iot-important

Number of Internet of Things (IoT) connected devices worldwide from 2019 to 2021, with forecasts from 2022 to 2030

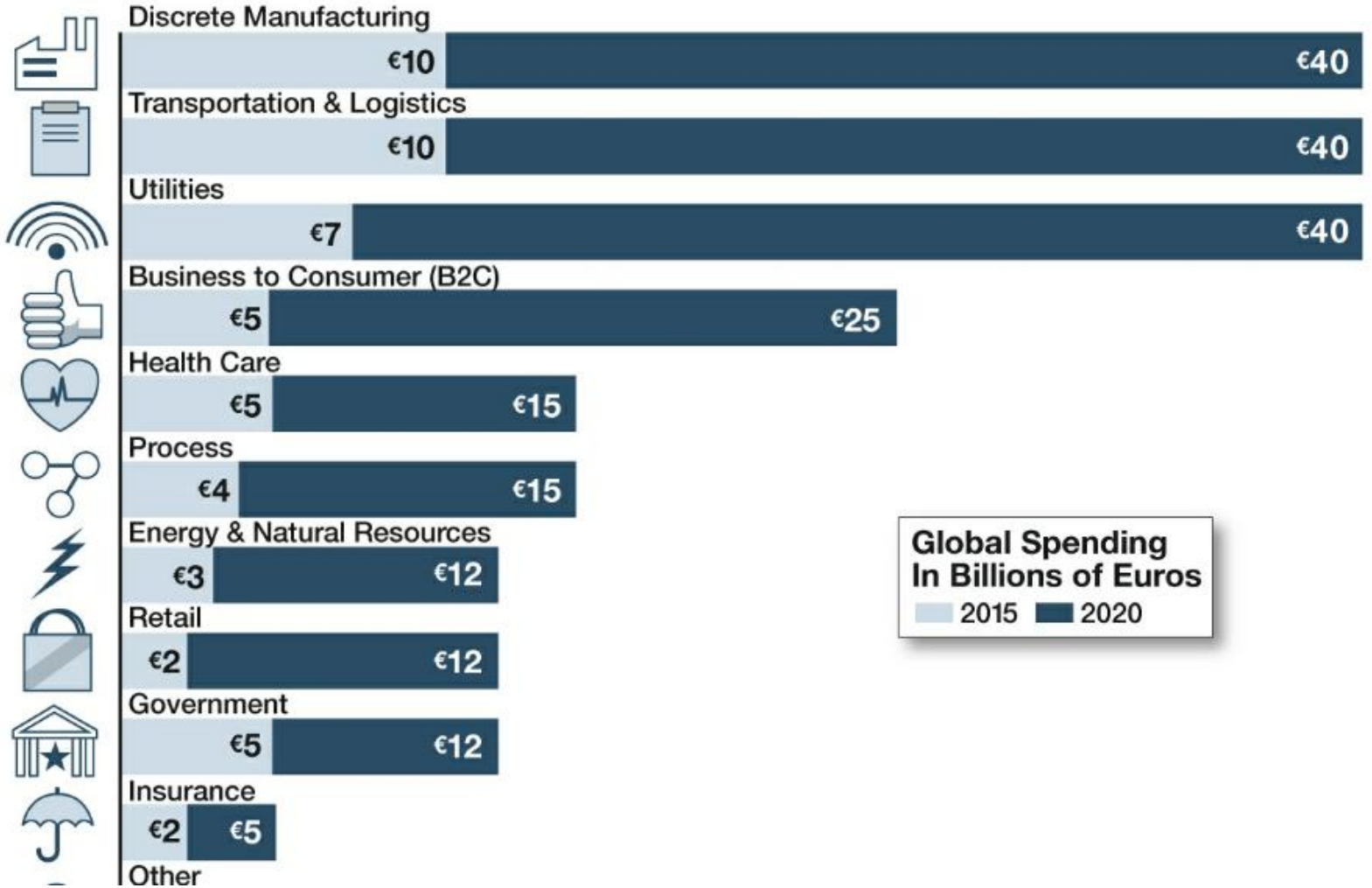
Internet of Things (IoT)



Source: https://www.statista.com/statistics/1183457/iot-connected-devices-worldwide/

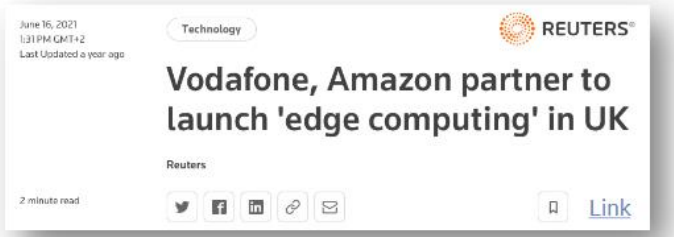
IoT Spending by Sector

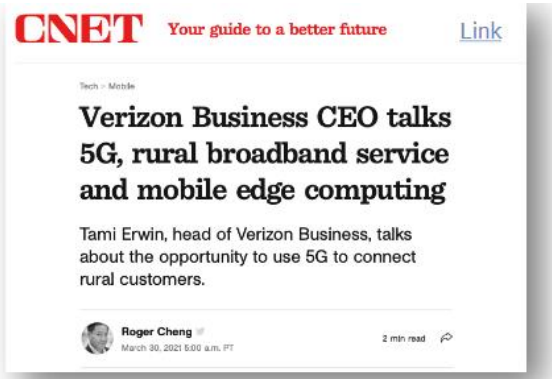
Discrete Manufacturing, Transportation & Logistics and Utilities will dominate the IoT spending.

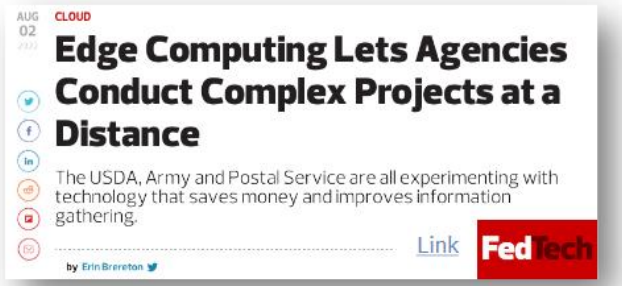


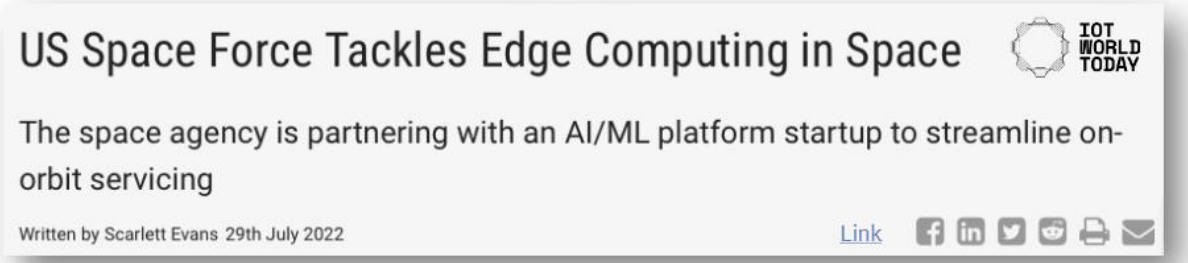
Source: Boston Consulting Gruppe, “Winning in IoT” (2019)

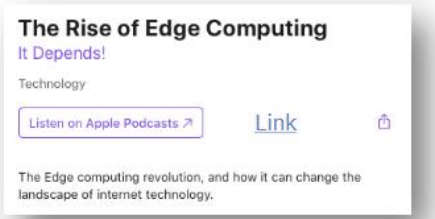
Edge Computing – Enabler for IoT use cases





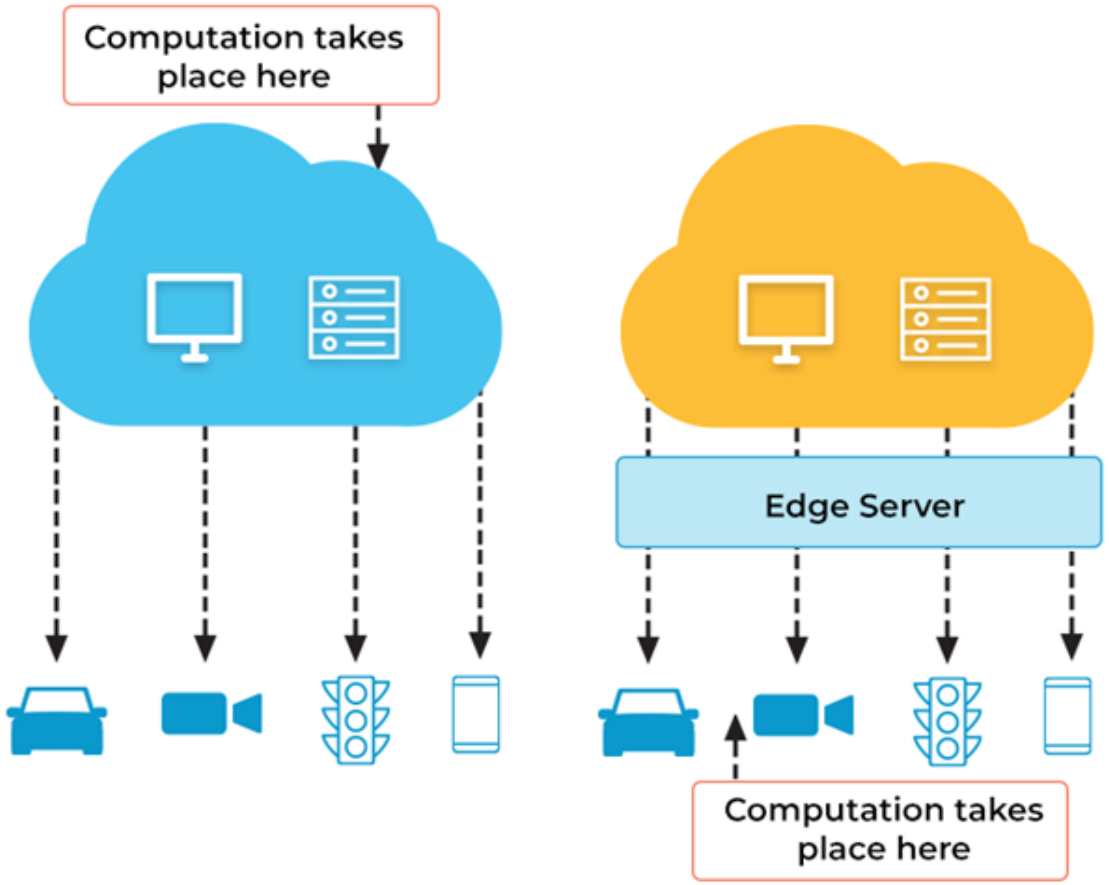




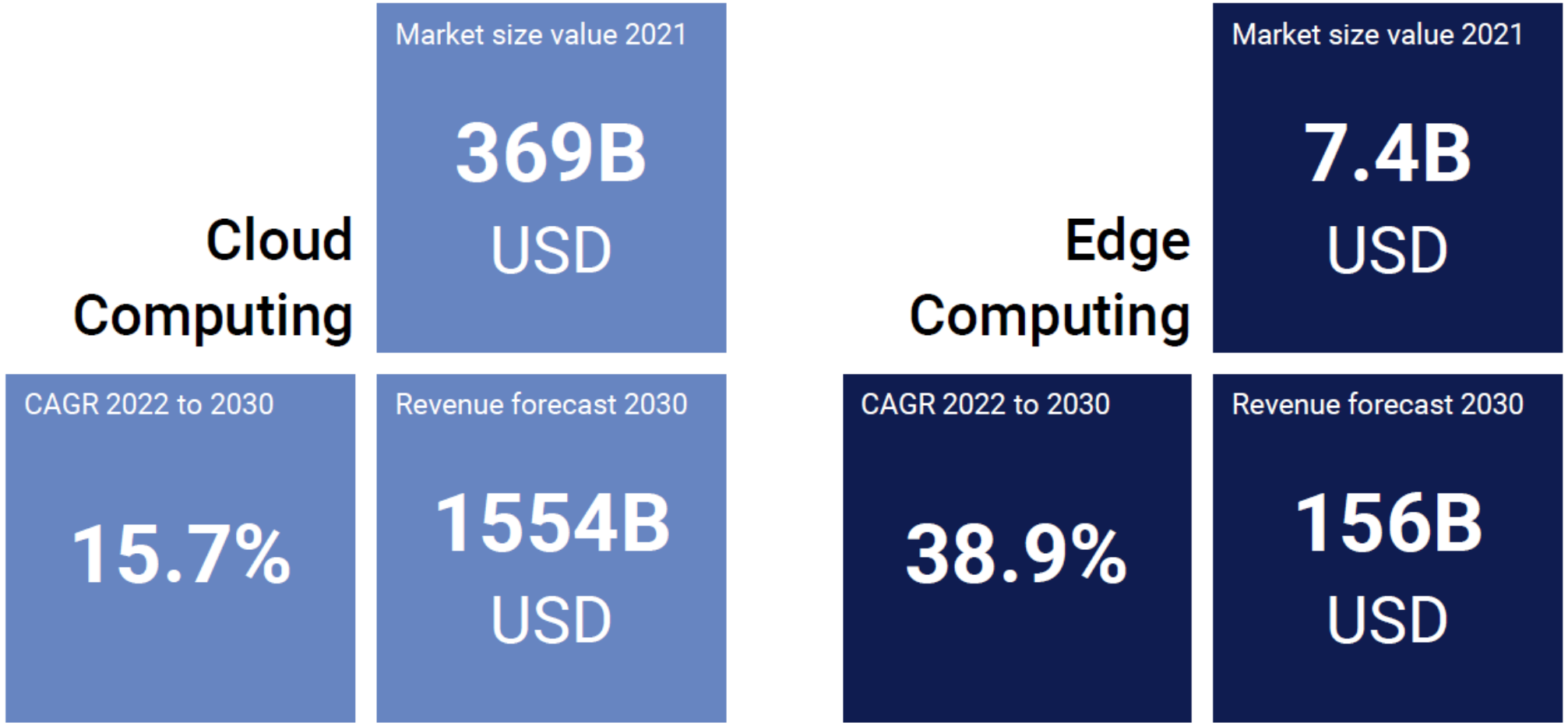


Edge Computing – Enabler for IoT use cases

Distributed IT architecture in which data is processed at the periphery of the network, as close to the originating source as possible

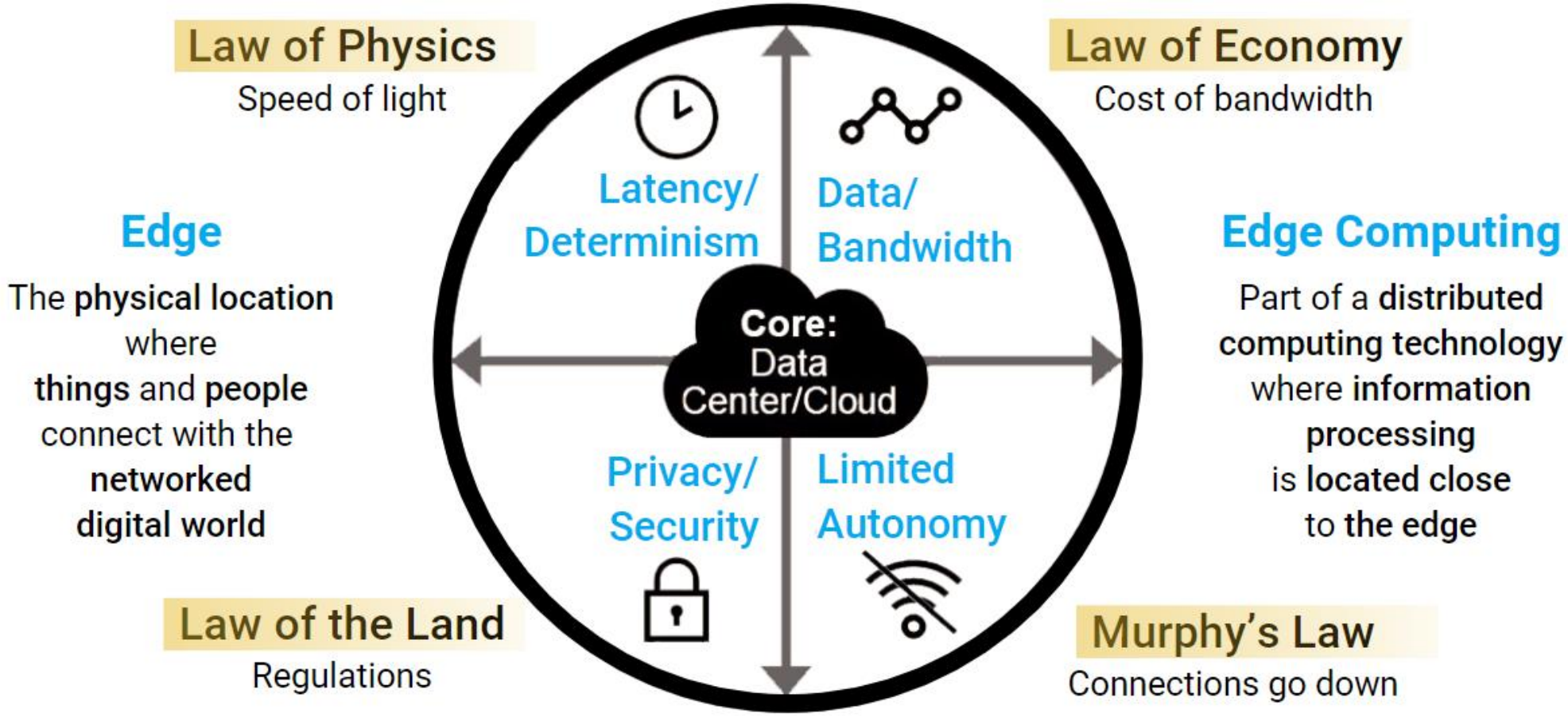


Market Numbers



Source: Grand View Research 2022

Four imperatives driving Compute to the Edge



Source: https://blogs.gartner.com/bob-gill/2021/09/24/notes-from-the-edge-your-portal-into-the-world-of-edge-computing-at-gartner-and-beyond/

The journey into cloud is often followed by a journey out of the cloud