DEFINING FEATURES OF TRACEABILITY AND BIG DATA IN THE AGRI-FOOD VALUE CHAIN

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Agri-food value chain

- The **whole range** of goods and services...

- ...necessary for an agricultural product to move:
  - *From the farm*
  - *To the final customer or consumer.*

- Business enterprises **working together** by linking:
  - *Production*
  - *Processing*
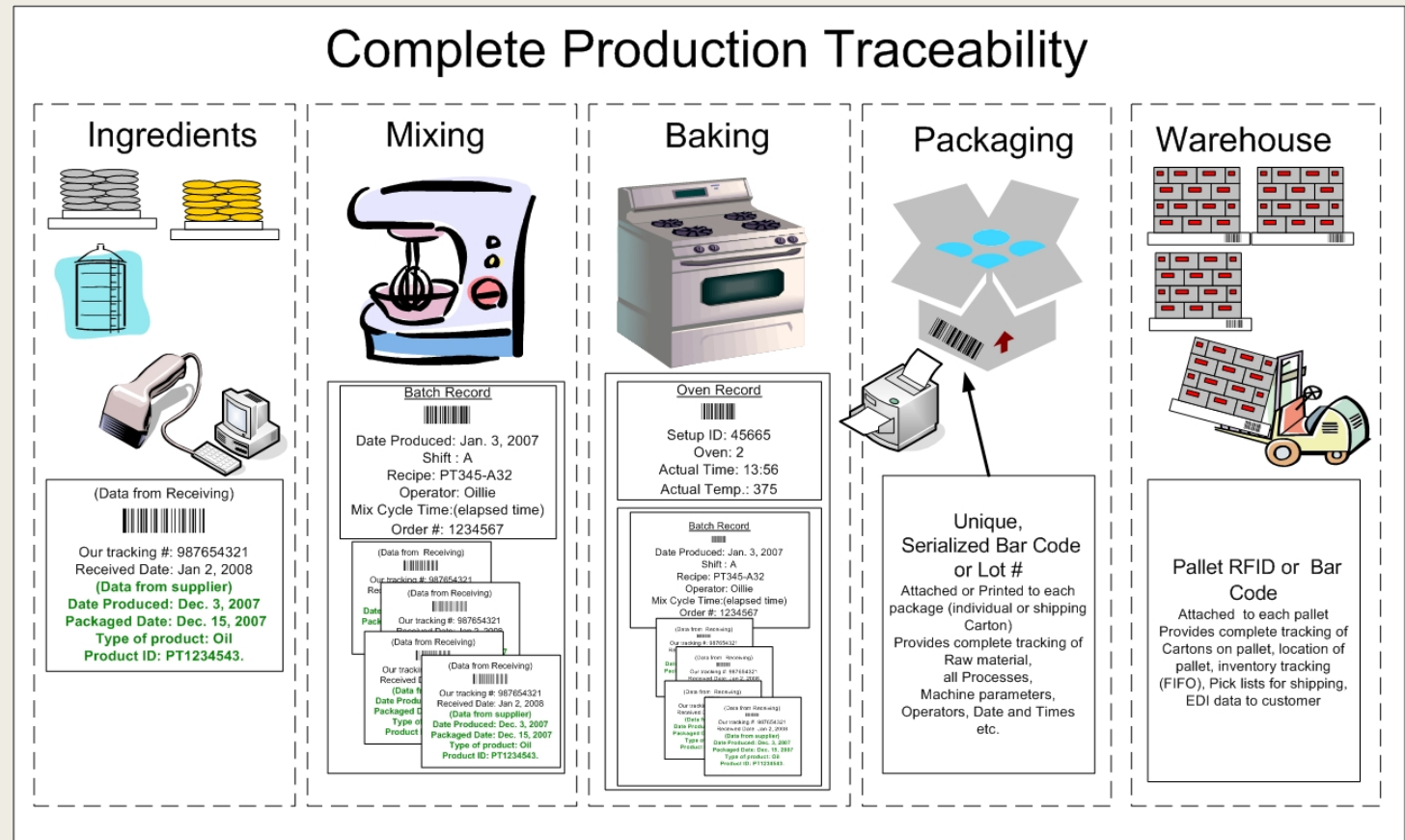 - *Marketing*

- To:
  - *Market demands.*

Agri-food value chain

- Designed through **collaboration** in a venture that links:
  - *Producers*
  - *Processors*
  - *Marketers*
  - *Food service companies*
  - *Retailers*
  - *Shippers, research groups, suppliers...*

- **Strategic partnership** among inter-dependent businesses

- Integrative collaboration to **progressively create value** for the final consumer

- Resulting in a **collective competitive advantage**
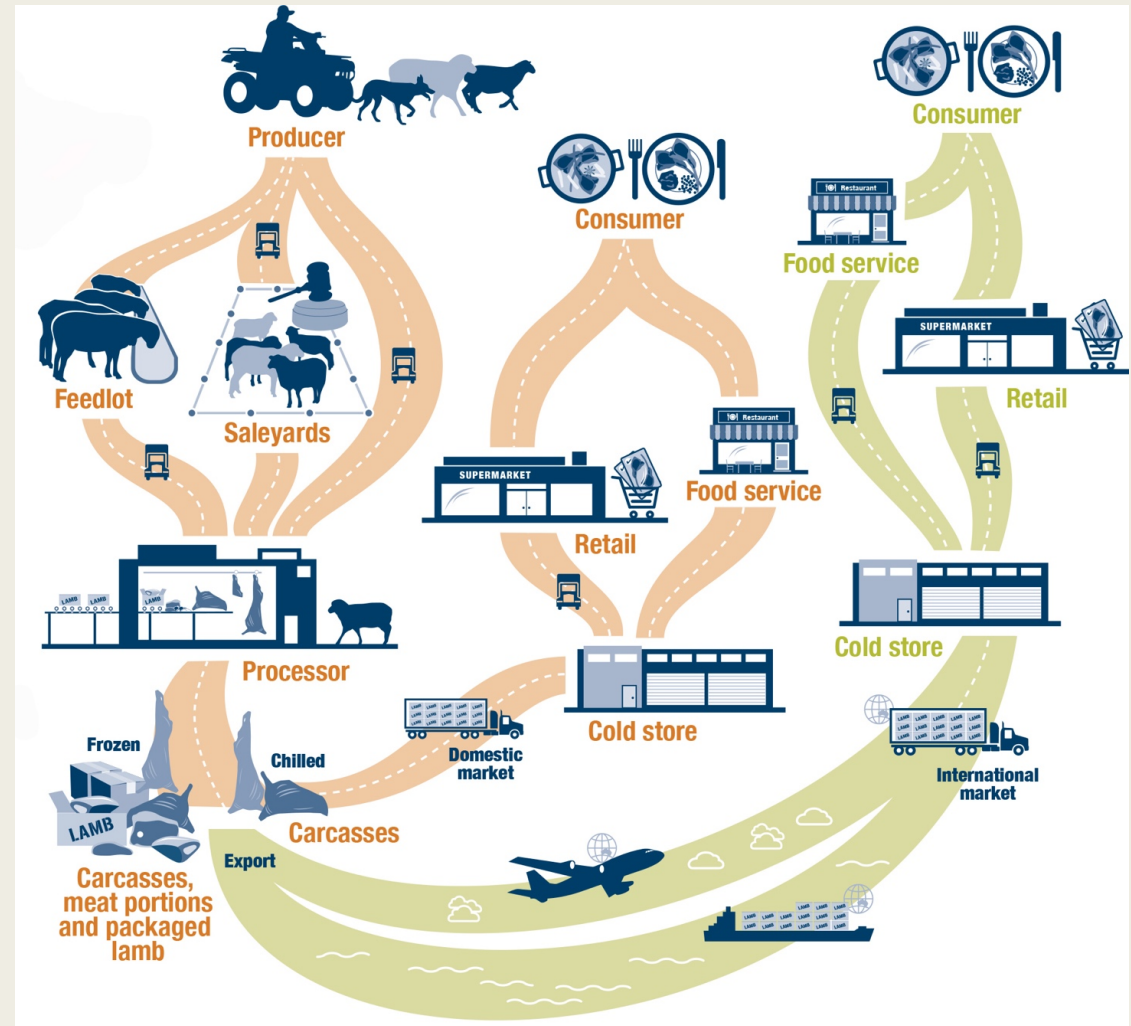
Traceability

- **Ability to <u>verify</u>:**
  - *History*
  - *Location*
  - *Application*

  of items by means of:
  - *Documented recorded identification (barcodes, RFID tags & other tracking media)*

- **Possibility to <u>identify</u>:**
  - *Contamination issues*
  - *High production & quality areas*
  - *Low production returns*
  - *...*

Complete Production Traceability

| Ingredients | Mixing | Baking | Packaging | Warehouse |

Batch Record

(Data from Receiving)

Our tracking #: 987654321
Received Date: Jan 2, 2008
(Data from supplier)
Date Produced: Dec. 3, 2007
Packaged Date: Dec. 15, 2007
Type of product: Oil
Product ID: PT1234543.

Batch Record

Date Produced: Jan. 3, 2007
Shift : A
Recipe: PT345-A32
Operator: Oillie
Mix Cycle Time:(elapsed time)
Order #: 1234567

Oven Record

Setup ID: 45665
Oven: 2
Actual Time: 13:56
Actual Temp.: 375

Batch Record

Date Produced: Jan. 3, 2007
Shift : A
Recipe: PT345-A32
Operator: Oillie
Mix Cycle Time:(elapsed time)
Order #: 1234567

Unique, Serialized Bar Code or Lot #
Attached or Printed to each package (individual or shipping Carton)
Provides complete tracking of Raw material, all Processes, Machine parameters, Operators, Date and Times etc.

Pallet RFID or Bar Code
Attached to each pallet Provides complete tracking of Cartons on pallet, location of pallet, inventory tracking (FIFO), Pick lists for shipping, EDI data to customer

Traceability

- Traceability systems imply the use of **piece of data**:
  - *Order date/time*
  - *Serialized sequence number*
  - *Other extra info*

- It can be **traced** through the entire production flow

- **Linking all sections** of the business through the supply chain

- Objects at any point in the system can be **audited** using the **traceability software**

- Possibility to find any particular transaction/product within the supply chain:
  - *Backward traceability*
  - *Forward traceability*
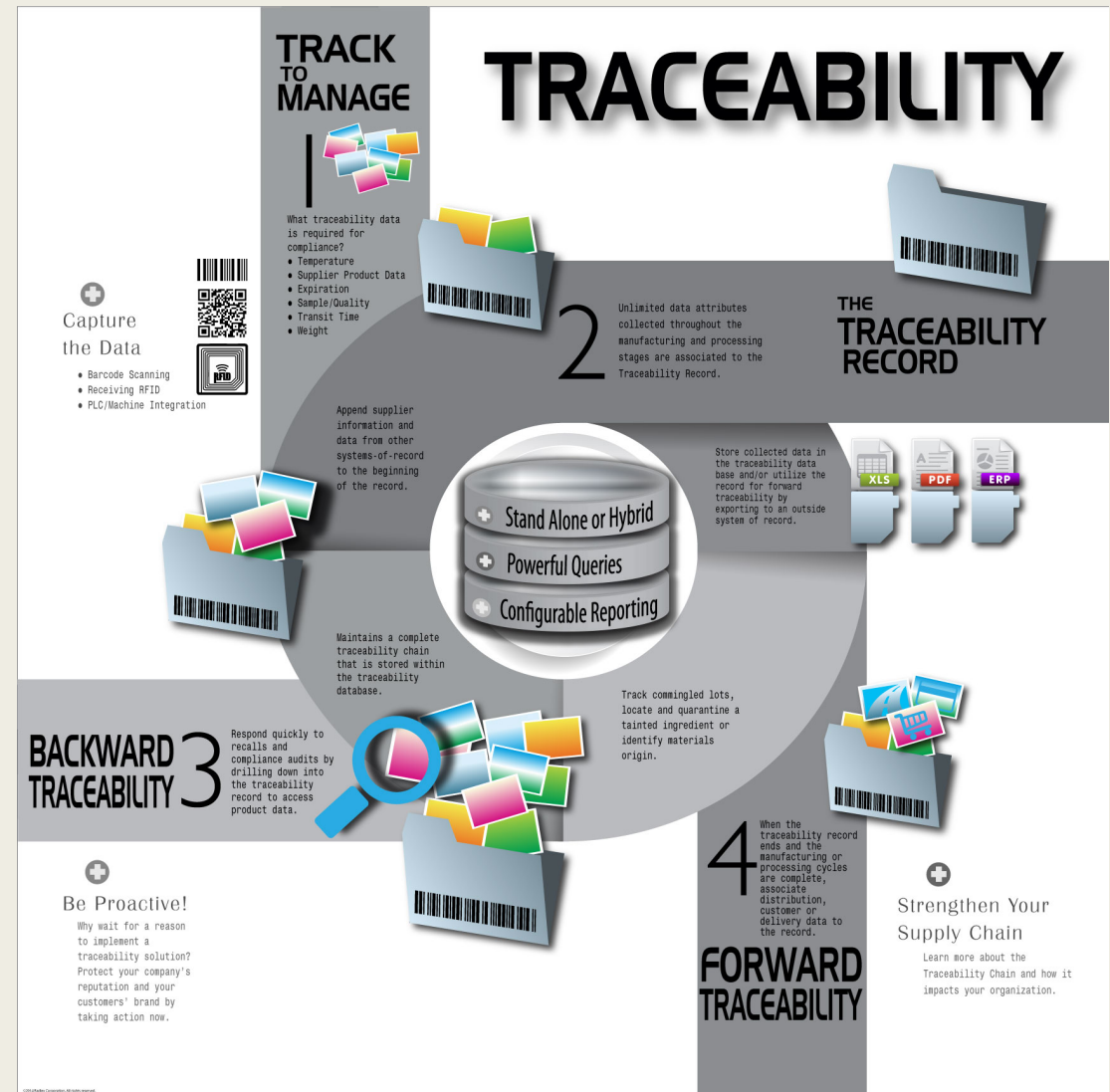
Data Acquisition

- Data is collected from a network of sensors

- Sensorization can be applied to every point in the value chain:

  - *From farms, greenhouses, fish-farms…*
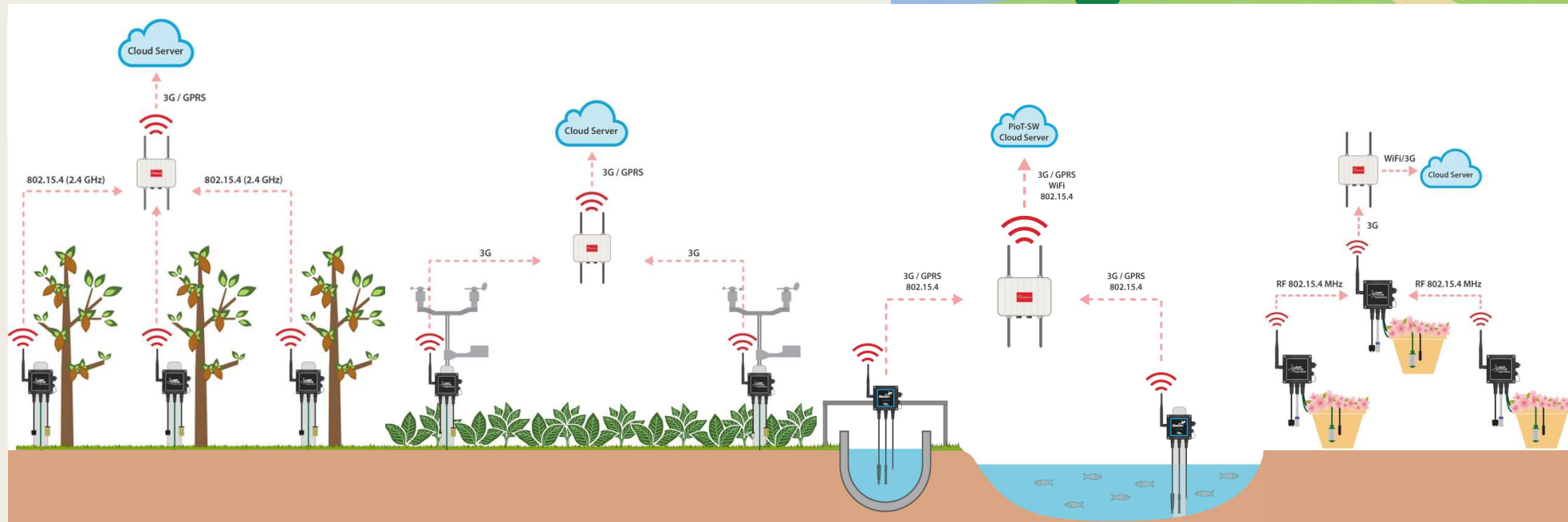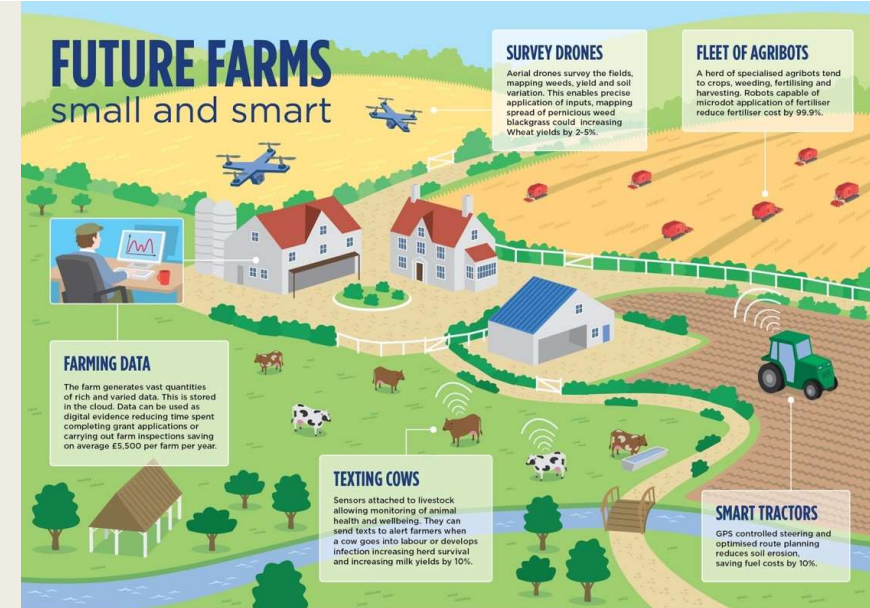
Data Acquisition

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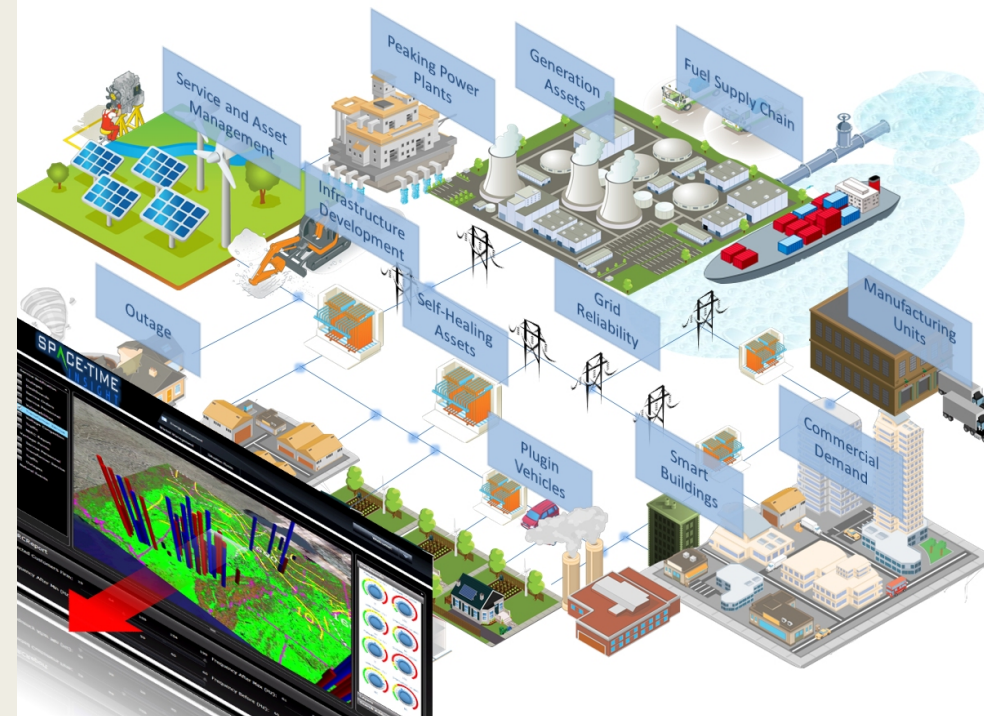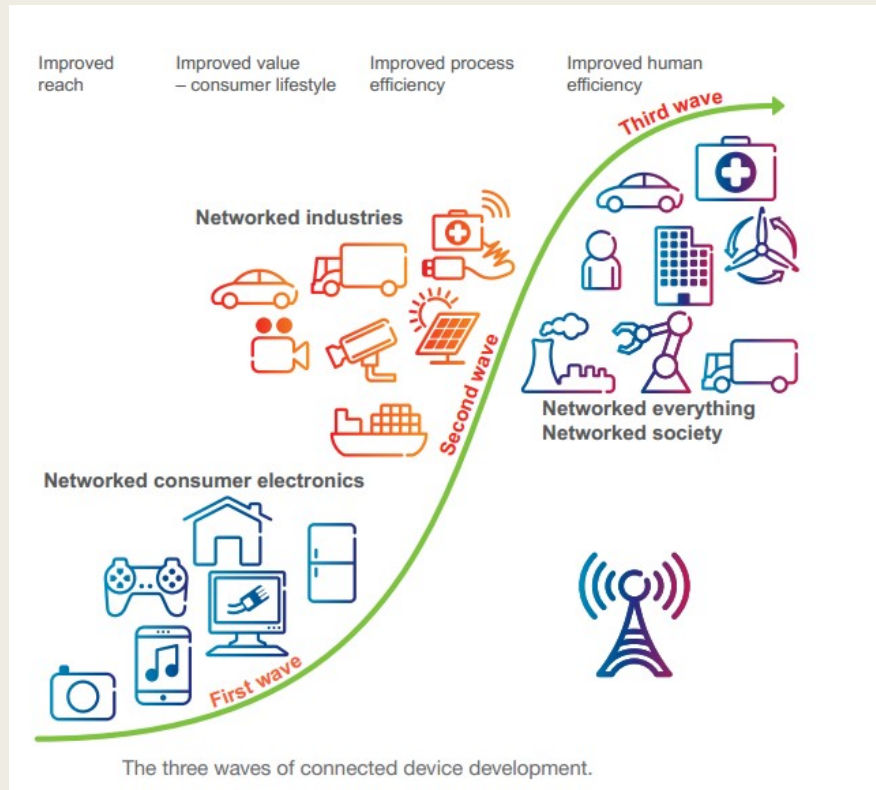 - ... to *logistics*.
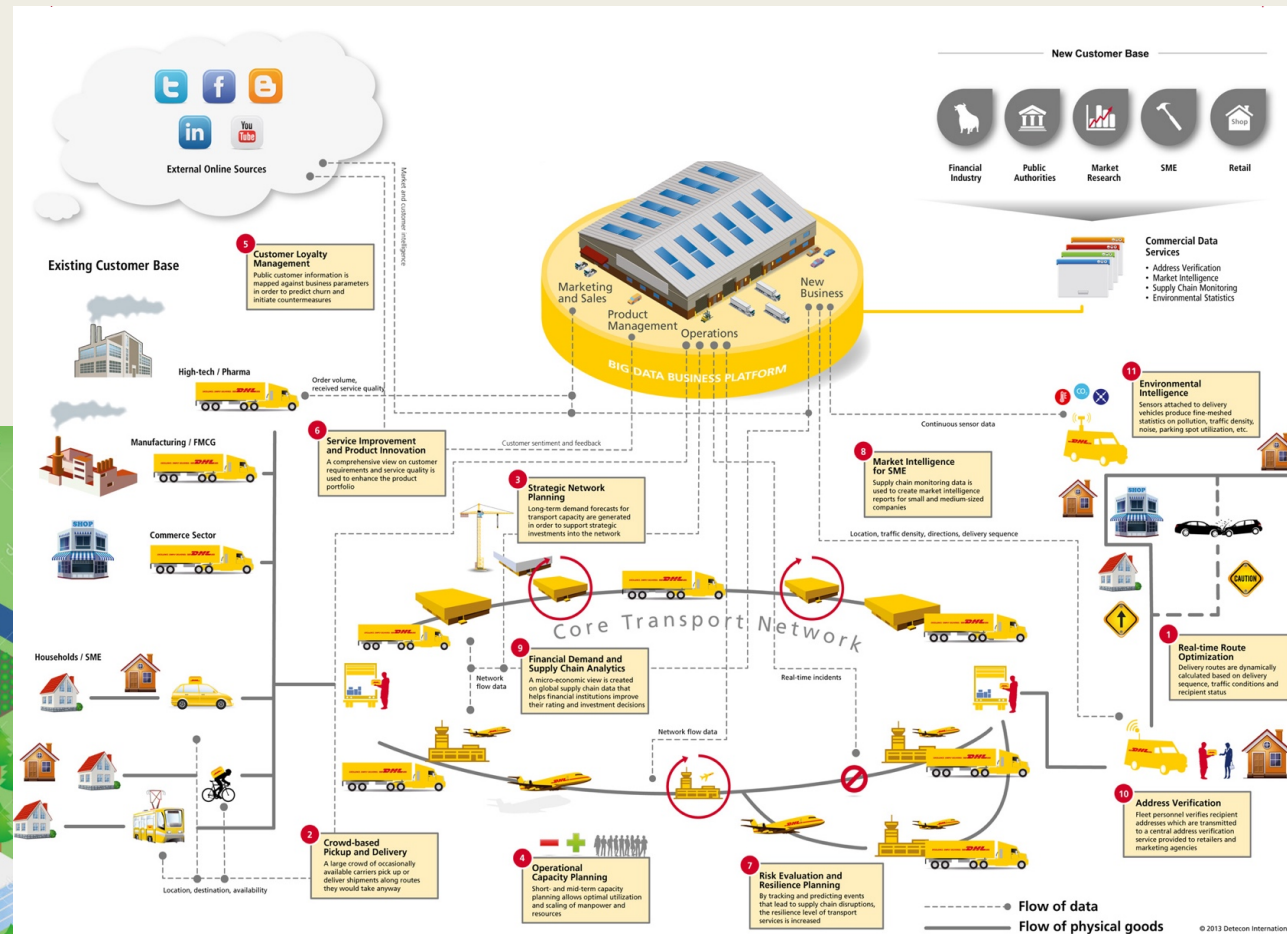
Internet of Things (IoT)

- Internet of things (IoT) is a **wide inter-networking of physical devices**

- Devices are **embedded** with electronics, software, sensors, actuators and **network connectivity**

- IoT devices are able to **collect** and **exchange data**

- IoT is defined as *"the infrastructure of the information society"*

- Objects can be **controlled remotely** and **integrated** in computer-based systems

- IoT results in improved **efficiency, accuracy** and **economic benefit** in addition to **reduced human intervention**

- IoT leads to **smart objects:**
  - *Smart machineries*
  - *Smart farms*
  - *Smart factories*
  - *Smart transports*
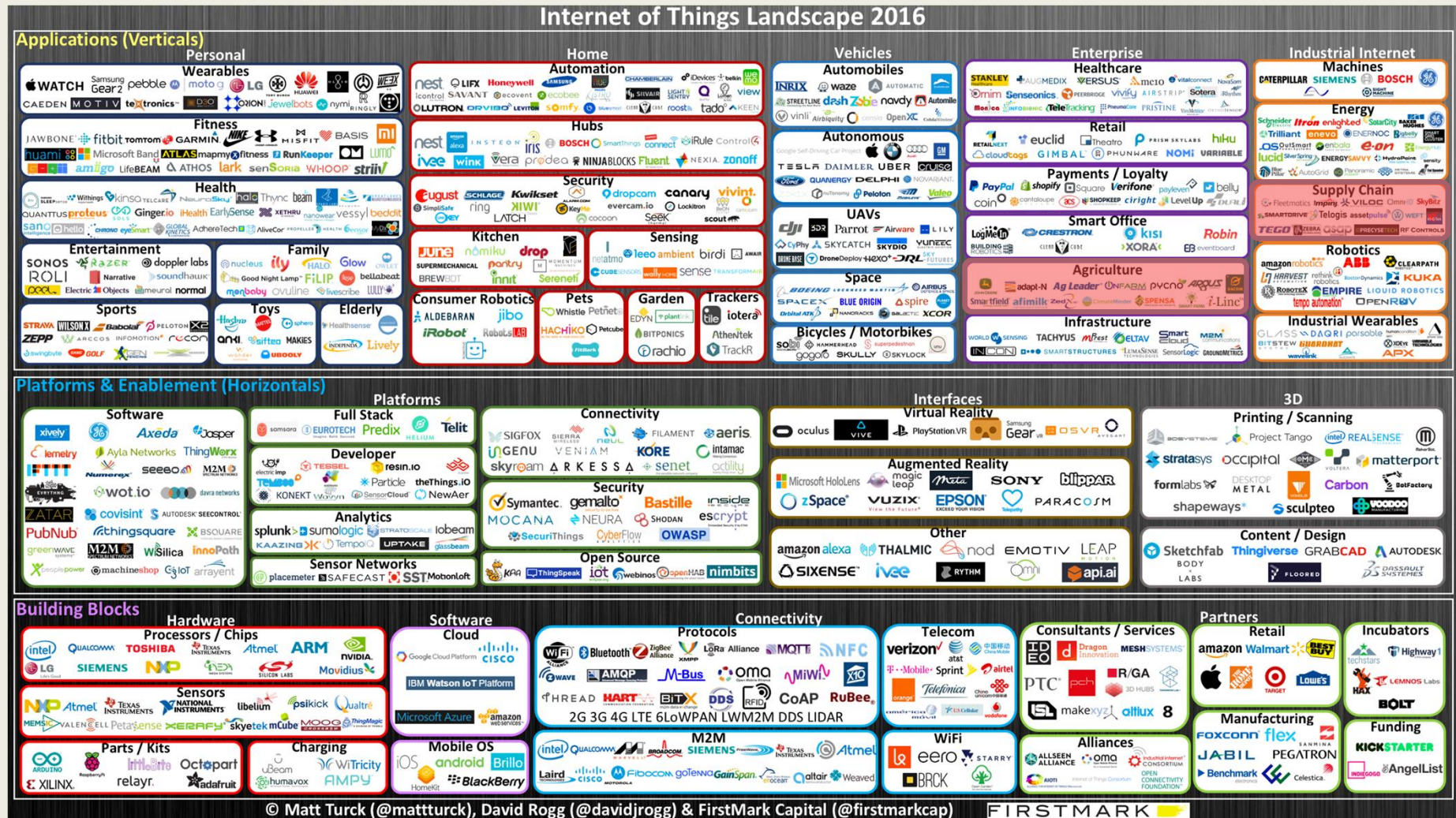 - *Smart marketing*
  - *Smart cities*

Internet of Things (IoT)

■ Experts estimate that the IoT will consist of almost **50 billion objects** by 2020.

The three waves of connected device development.

Internet of Things (IoT)

Internet of Things Landscape 2016

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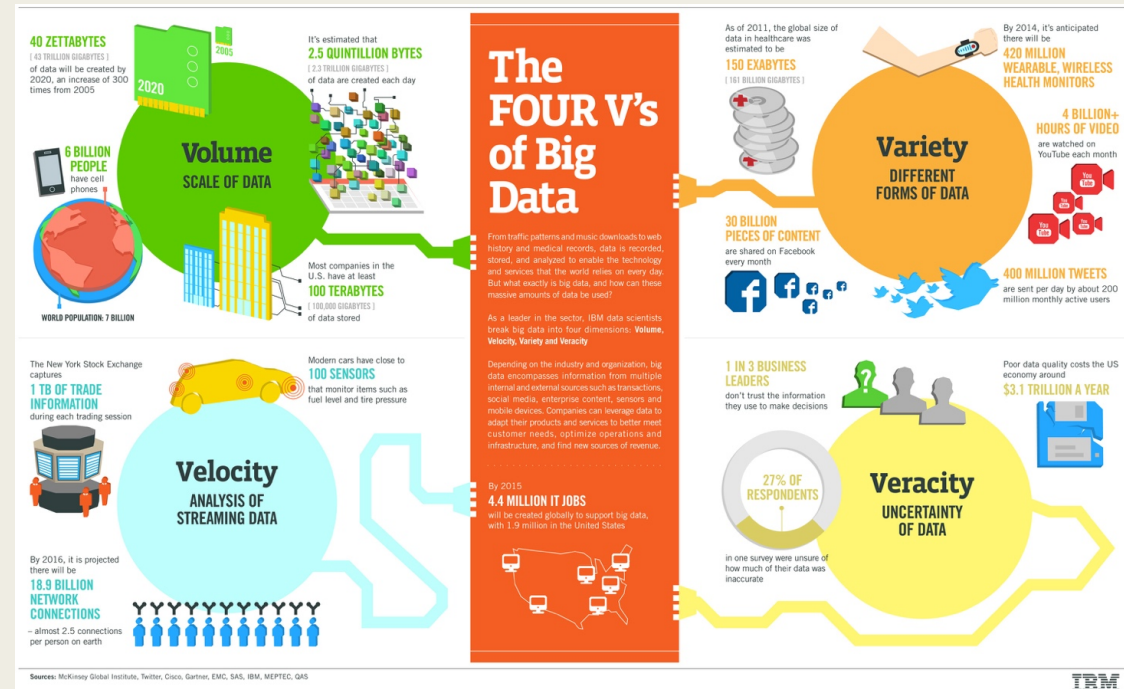
Big Data

- IoT produces a **huge amount of data**
- Computer systems:
  - *Hardware*
  - *Software*

  should address such amount of data.
- The science that studies this problem is the **computer science**
- **Technically, Big Data only means** two things:

  1. Huge **volume** of data of high **variety** and **veracity** captured at high **velocity**.
  2. **Hardware & software technologies** to address such kind of data.
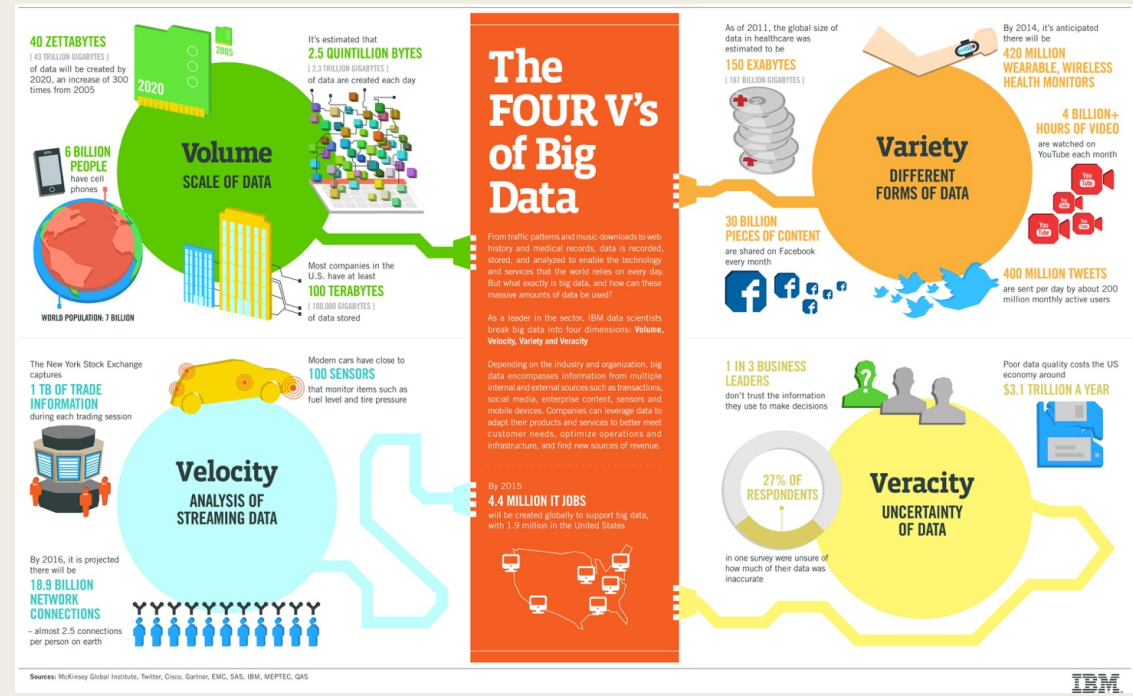
Big Data

- The **real value** is to **gain knowledge** and insights **from the huge amount of data**

- For such reason, **Big Data** is **commonly confused** with **other sciences**

- **Commercially, Big Data also means:**

   3. Intelligent data analysis to produce insights from data.

   4. Predictive analytics, forecasting and data visualization.

- However, these meanings are formally covered by other sciences.

Landscape

- Agri-food value chain
- Traceability
- Internet of Things

- Big Data (technically)
  - *Software & hardware to address huge volumes of data*

- Artificial Intelligence
  - *Data Mining*
  - *Machine Learning*

- Data Analytics (diagnosis)
- Predictive modeling & forecasting (prognosis)

- Bussiness Intelligence

Landscape

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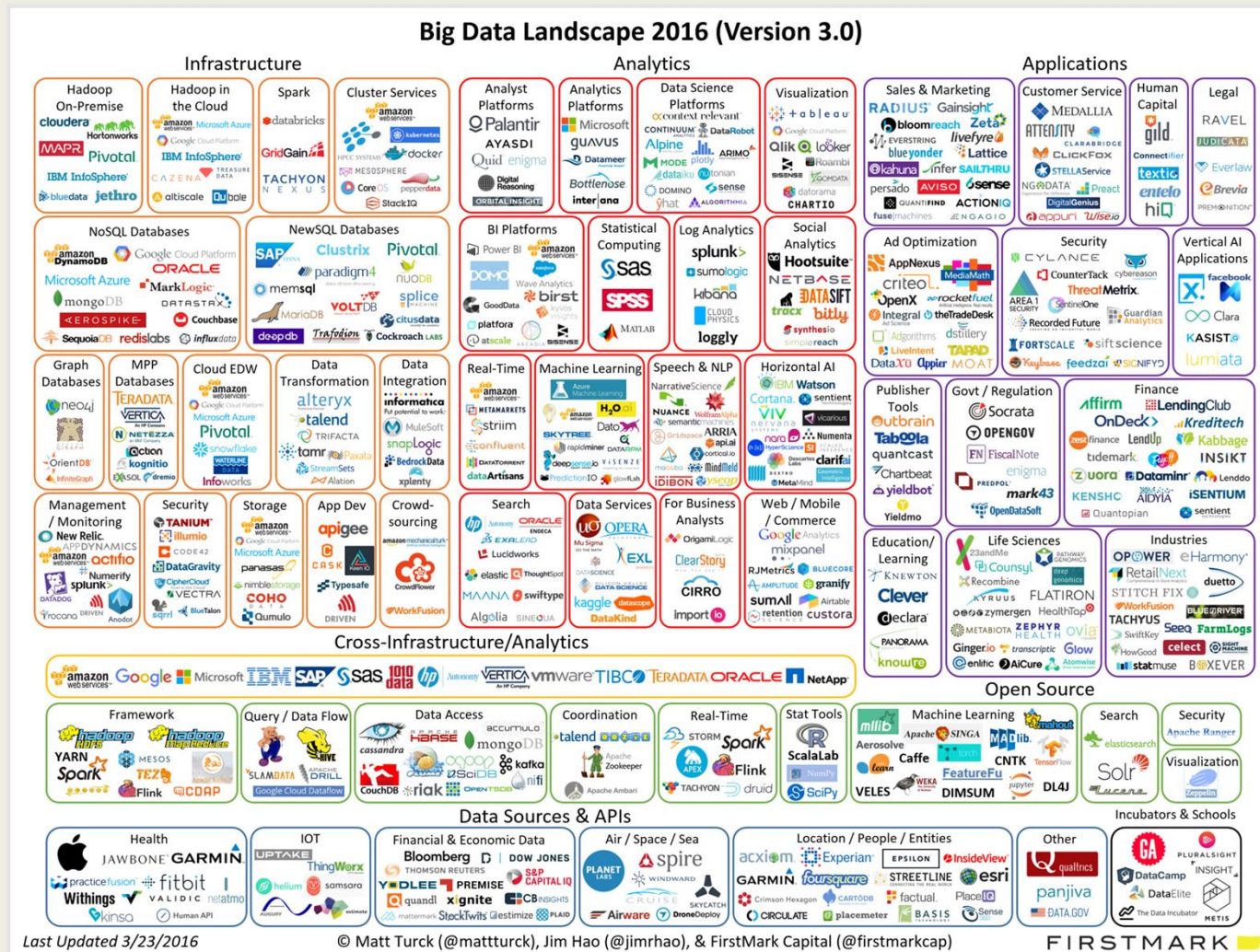
- Big Data (commercially)

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  - *Machine Learning*

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- Bussiness Intelligence

Big Data Technologies

Big Data Landscape 2016 (Version 3.0)

Data Value Roadmap
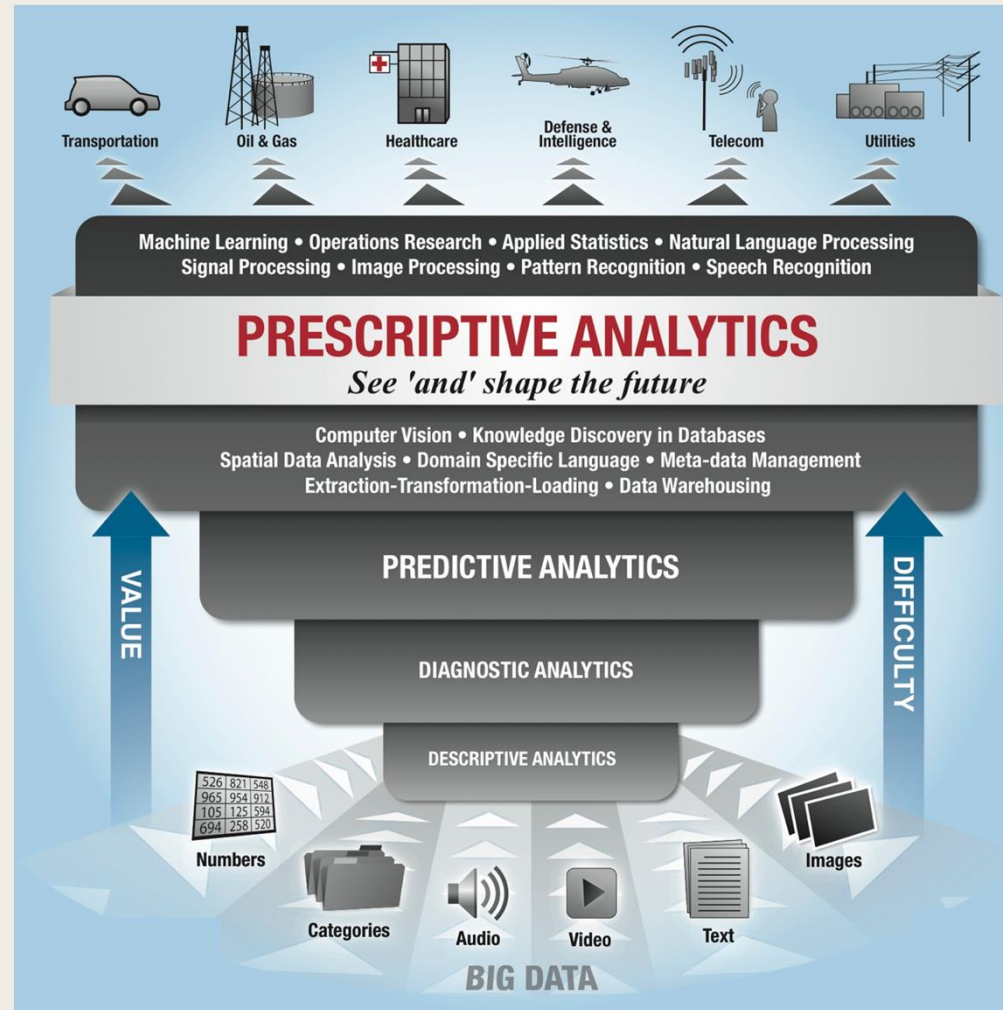
Conclusions

- Data integration is critical due to the huge amount of data from the diverse points of the agri-food value chain.

- Technology management is also critical to select and update the most suitable for each point of the supply chain.

- Technologies and their underlying concepts must be well known to avoid overlaps in the information systems that support the whole agri-food value chain.

THANK YOU

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