

# ICT

Online session  
For MES officers  
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# ICT for Corona Virus tracking

## Singapore Example – Bluetooth



### How TraceTogether works

We use Bluetooth signals to determine if you are near another TraceTogether user.

This proximity data is encrypted and stored only on your phone.



## South Korea Example - GPS



If a person using the app comes within 100 meters of any location where an infected person has been, a push notification is issued.

# What about ICT for corona virus spread analysis?

- SOON.....



# ICT complexity space

## **Intra-segment complexity:**

Each segment of ICT is a system by itself with its own specialist players, technology issues etc and hence difficult to fully understand and hence complex

**Possible solution:** Adoption of Enterprise Architecture

## **Economic factors: Network effect**

Reputation of the company alone not sufficient for decision. In their hurry to convert a huge network of users to their service, vendors focus on quick user-base expansion and as a result quality, performance etc suffer'

**Possible solution:** Enterprise Architecture,  
Looking out for Standards compliance

## **Human factors: ICT technical personnel**

If your KEY software personnel are all “C++ and Oracle” people, what are the chances they will permit a new solution which is “Python and Postgresql”? Even is the latter is superior?

**Possible solution:** Detailed sustainability projections, technology trajectory simulations

## **Process / Environment change factors: Cascading effect**

When processes or environments change – for example “functioning of offices and conduct of meetings over the web” due to corona virus, your current network ,business applications might not scale up

**Possible solution:** Sustainability simulations, Exploring the “cloud” as a replacement option, monetisation of existing assets



## **Multi-department / organisation Collaboration**

**challenges:** Multiple departments / organisations / User teams may not be able collaborate because of technical differences in their ICT

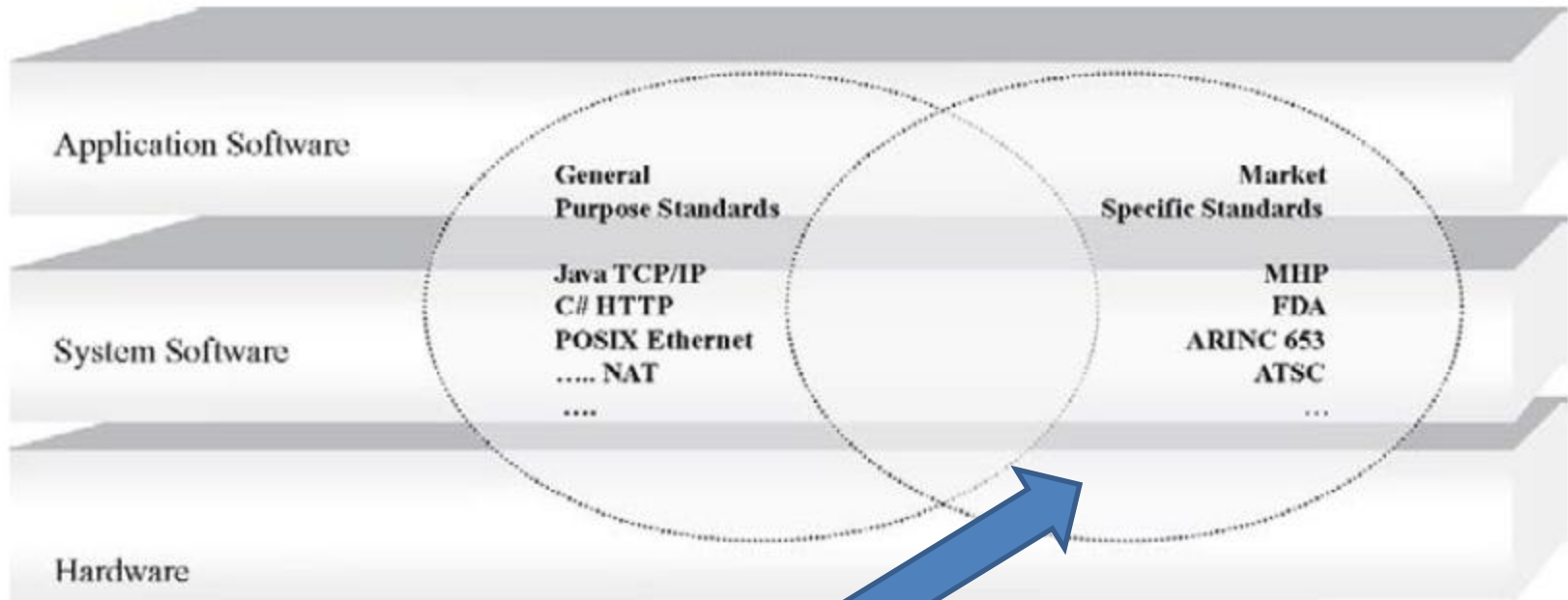
**Possible solution:** Exploration of middleware, Web services, APIs to link disparate systems

## **OT & IT Data deluge: Data overload complexity**

With the influx of IoTs to the ICT ecosystem [in addition to data from social media, video conferencing systems etc], making sense out of data has become an enormously difficult task

**Possible solution:** Introduction of data science practices

# Middleware standards



Special Implications for those who will be using smart building gadgets, IoTs, Sensors

# Service oriented Architecture, Application Program Interface [API] and Web services – important middleware

- SOA , API, and Web services are terms you must have come across a million times
- Just as Oracle database, Linux OS etc can be offered as SaaS, so also tiny, tiny things like *“check credit score of customer”*, *“Validate Aadhaar number”* etc.
- These are the examples of services and SOA, API, WS etc allow any program to utilise such services without knowing the internal details of how the validations are carried out

# Moving on to Data...

## Data science, Open Data, “Sharing” of data, Big Data etc

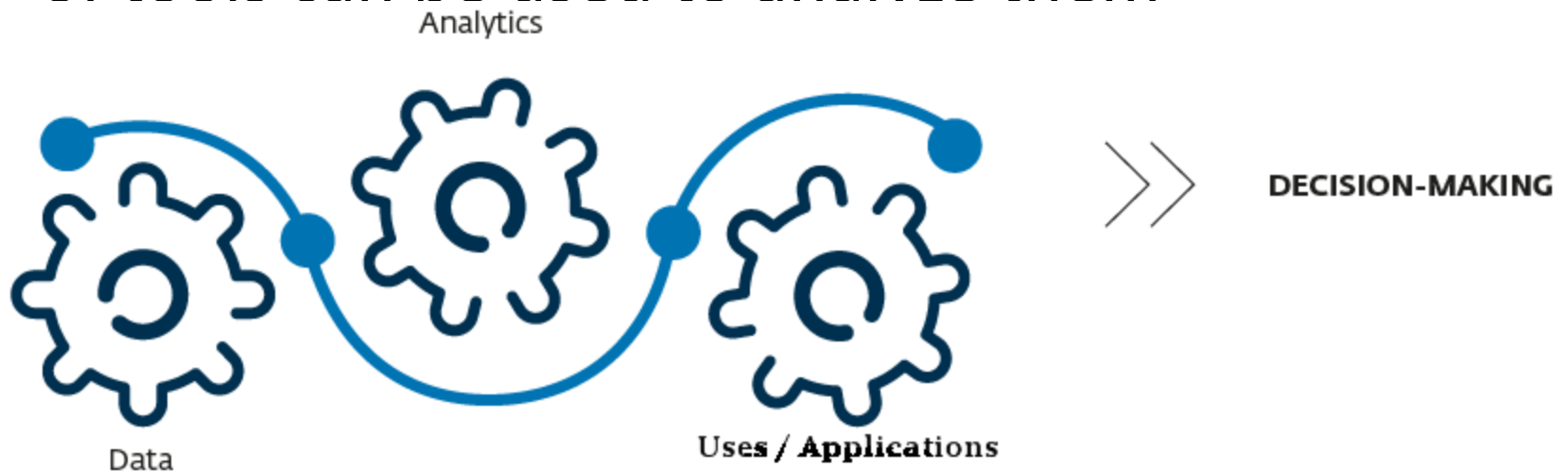
- Data.gov.in Single point of access to Gov data
- Even commercial data of strategic value sometimes shared
  - Netflix challenge – 10% improvement in algorithm
  - AOL search queries data made open for research
  - City of New York – 173 million Taxi records
- The point? Data is perhaps the biggest strategic asset of organisations [along with leadership] and we need to know the current Data Science trends

# Solutions to new challenges

- Data science can address many challenges
  - Through smart data analytics
  - Through simulations
  - Through AI / ML

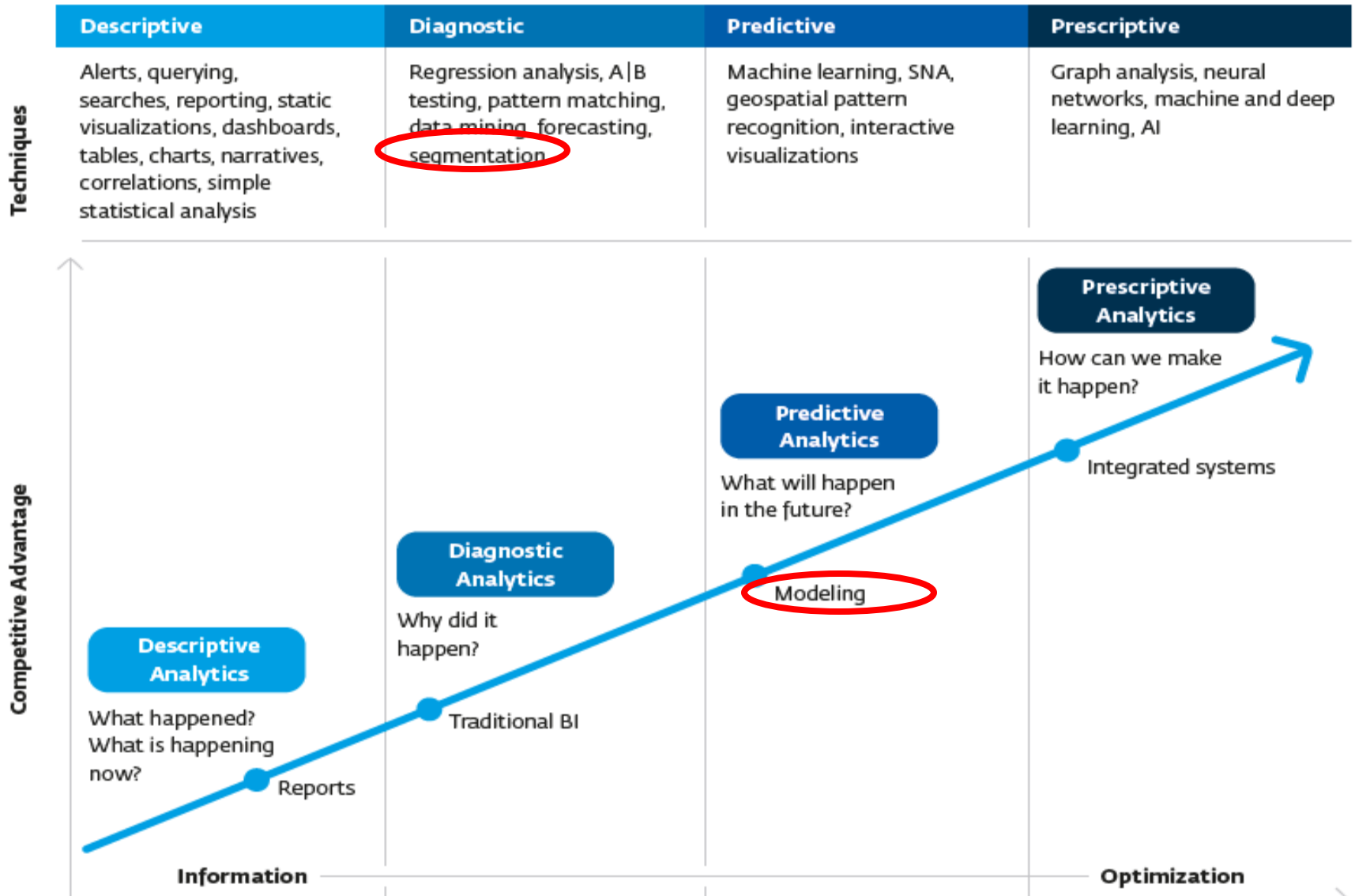
# Data

- *Data are samples of reality, recorded as measurements and stored as values*
- The manner in which the data are classified, whether they represent numbers, text, images, or sound , whether structured or unstructured, whether they exist in a digitized, machine-usable format and their source determine which types of tools can be used to analyze them



# What can you do with data?

## Types of Analytics



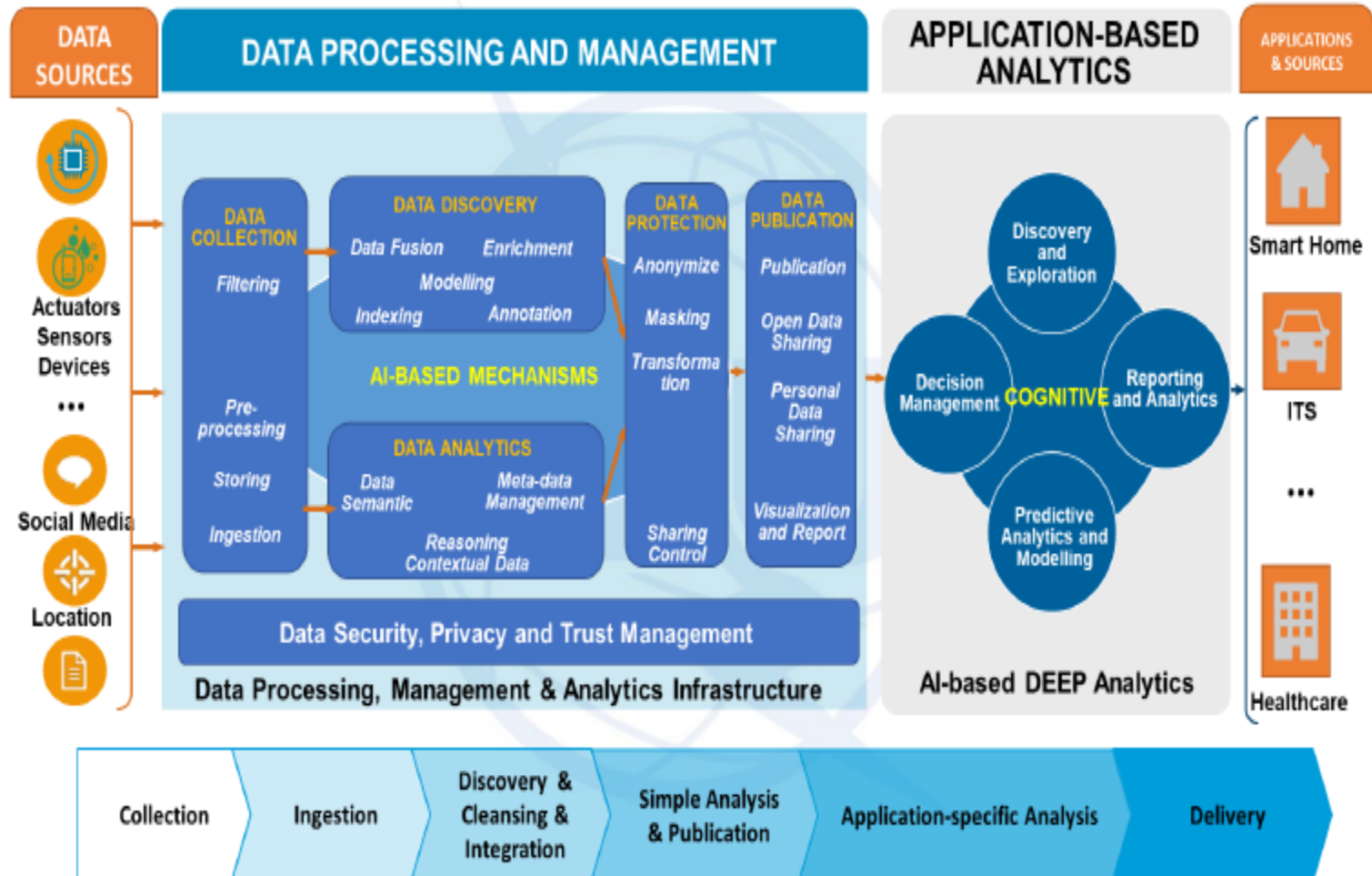


# Big data definition

- **Anecdotal definition – No numerical quantification:** Increasing size of data [**Volume**], the increasing rate at which it is produced [**Velocity**] and the increasing range of formats and representations employed [**Variety**]
- expanded upon by **IBM and others** to include a fourth V: *Veracity*

Aspect	Typical Scenario	Big Data
Application development	Applications that take advantage of massive parallelism developed by specialized developers skilled in high-performance computing, performance optimization, and code tuning	A simplified application execution model encompassing a distributed file system, application programming model, distributed database, and program scheduling is packaged within <b>Hadoop, an open source framework for reliable, scalable, distributed, and parallel computing</b>
Platform	Uses high-cost massively parallel processing (MPP) computers, utilizing high-bandwidth networks, and massive I/O devices	Innovative methods of creating scalable and yet elastic virtualized platforms take advantage of clusters of commodity hardware components (either cycle harvesting from local resources or through cloud-based utility computing services) coupled with <b>open source tools and technology</b>
Data management	Limited to file-based or relational database management systems (RDBMS) using standard row-oriented data layouts	Alternate models for data management (often referred to as <b>NoSQL or "Not Only SQL"</b> ) provide a variety of methods for managing information to best suit specific business process needs, such as in-memory data management (for rapid access), columnar layouts to speed query response, and graph databases (for social network analytics)
Resources	Requires large capital investment in purchasing high-end hardware to be installed and managed in-house	The ability to deploy systems like Hadoop on <b>virtualized platforms</b> allows small and medium businesses to utilize cloud-based environments that, from both a cost accounting and a practical perspective, are much friendlier to the bottom line

# Data-driven Artificial Intelligence of Things (AIoT)



# Machine Learning in action

# Let us look at an ACTUAL ML program in operation [Text classification]

<https://machinelearningforkids.co.uk>

Recognising **text** as **happy or sad**

[Back to project](#)

+ Add new label

**happy**

**sad**

smile

joy

white

green

hug

text

cry

fight

kick

red

salt

Try putting in some text to see how

smile

Recognised as **happy**  
with 100% confidence

Try putting in some text to see how it is recognised based on your training.

blue

Recognised as **happy**  
with 12% confidence

Try putting in some text to see how

scratch

Recognised as **sad**  
with 17% confidence

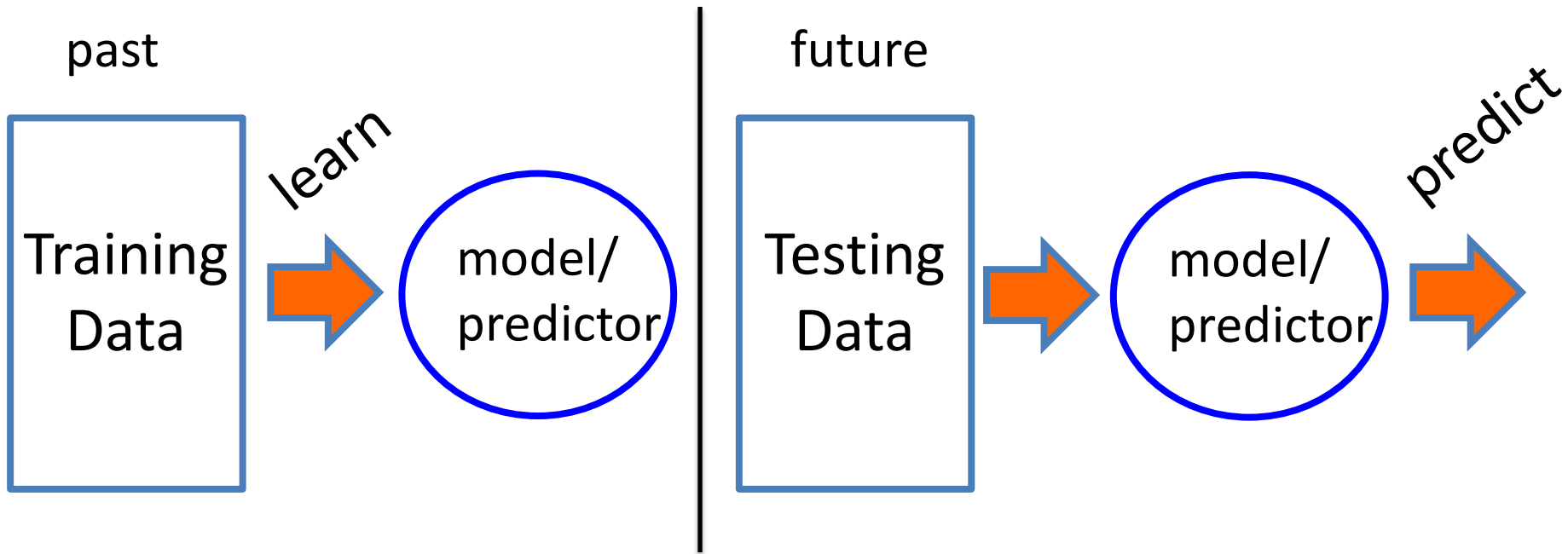
<https://magic-sketchpad.glitch.me/>

- Every time you start drawing a doodle, Sketch RNN tries to finish it and match the category you've selected.

<https://quickdraw.withgoogle.com/>

- Can a neural network learn to recognise doodles?

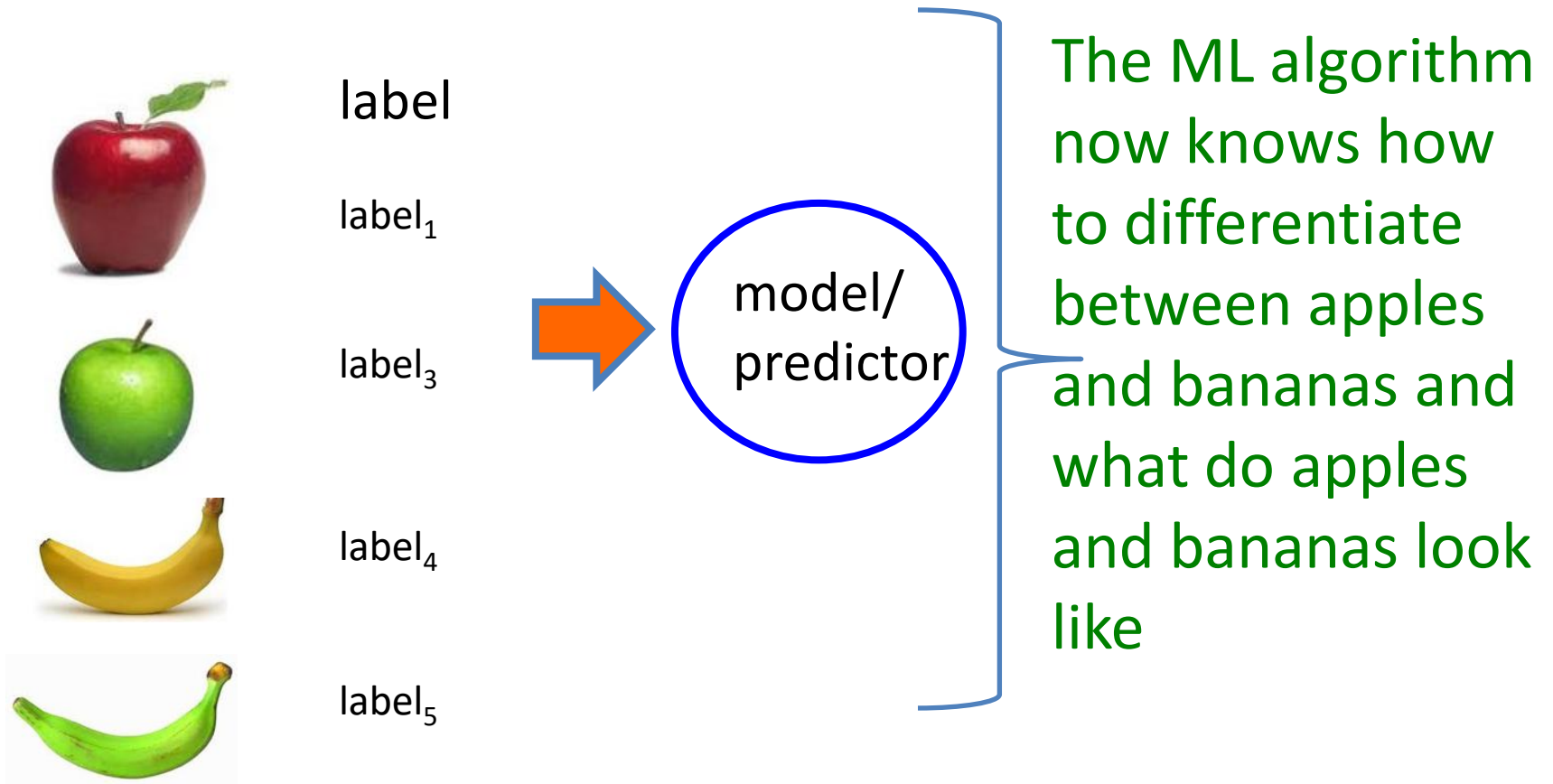
# Machine Learning



**AI / ML will be dealt in detail in a separate session by a different faculty.**

**In this session we will gain some familiarity**

# Supervised learning



Supervised learning: given labeled examples

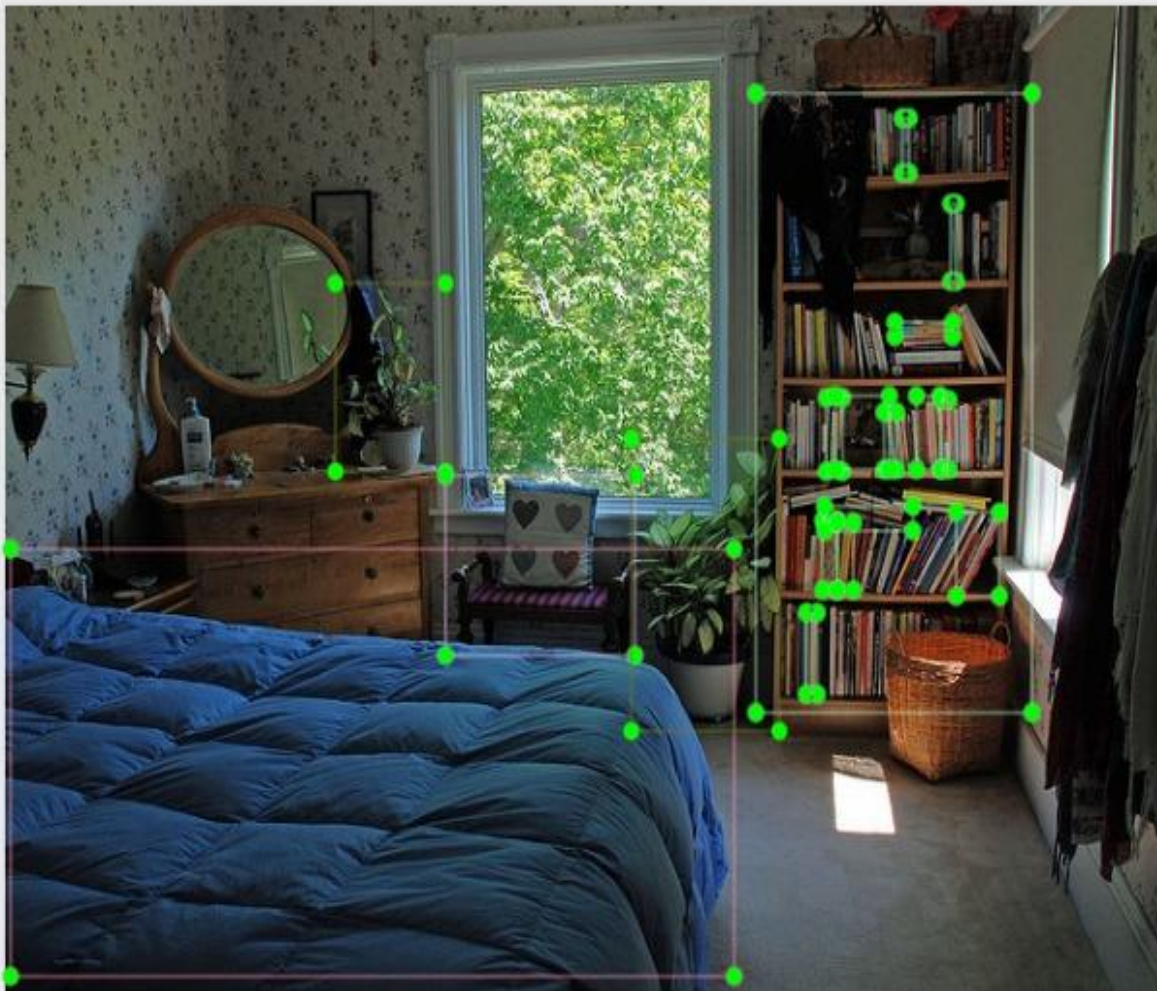


# Supervised learning

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Open  
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Change Save Dir  
Next Image  
Prev Image  
Verify Image  
Save



Box Labels

Edit Label

difficult

Use default label

- bed
- potted plant
- book
- book
- book
- book
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# Unsupervised learning

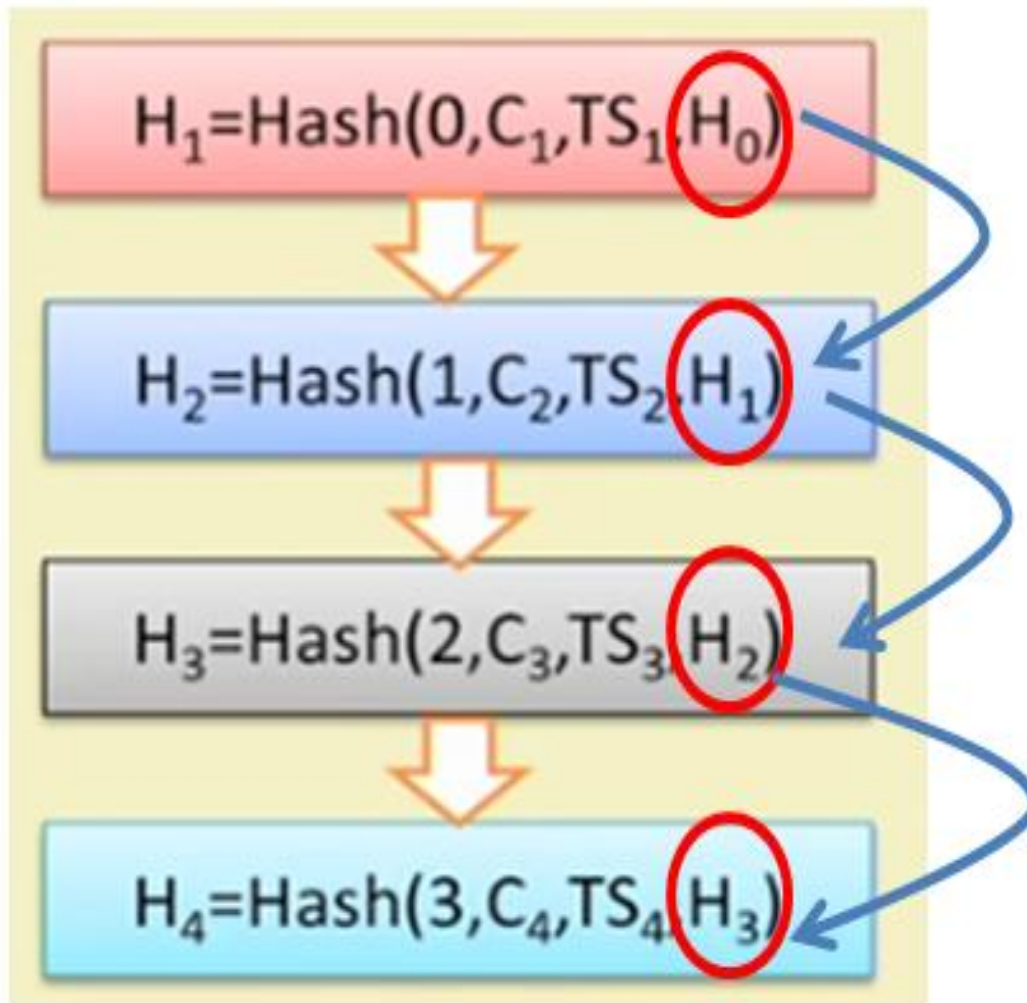


Unsupervised learning: given data, i.e. examples, but no labels... and the system tries to group them based on similarities and other factors

# Analytics, Big Data, AI ... all depend on quality data

- The current focus is on ensuring purity / integrity of data and its provenance
- Blockchain technology is proving to be a good candidate

# A “Chain” of records



A Block of  
“Chained”  
records

# Cryptographic hash

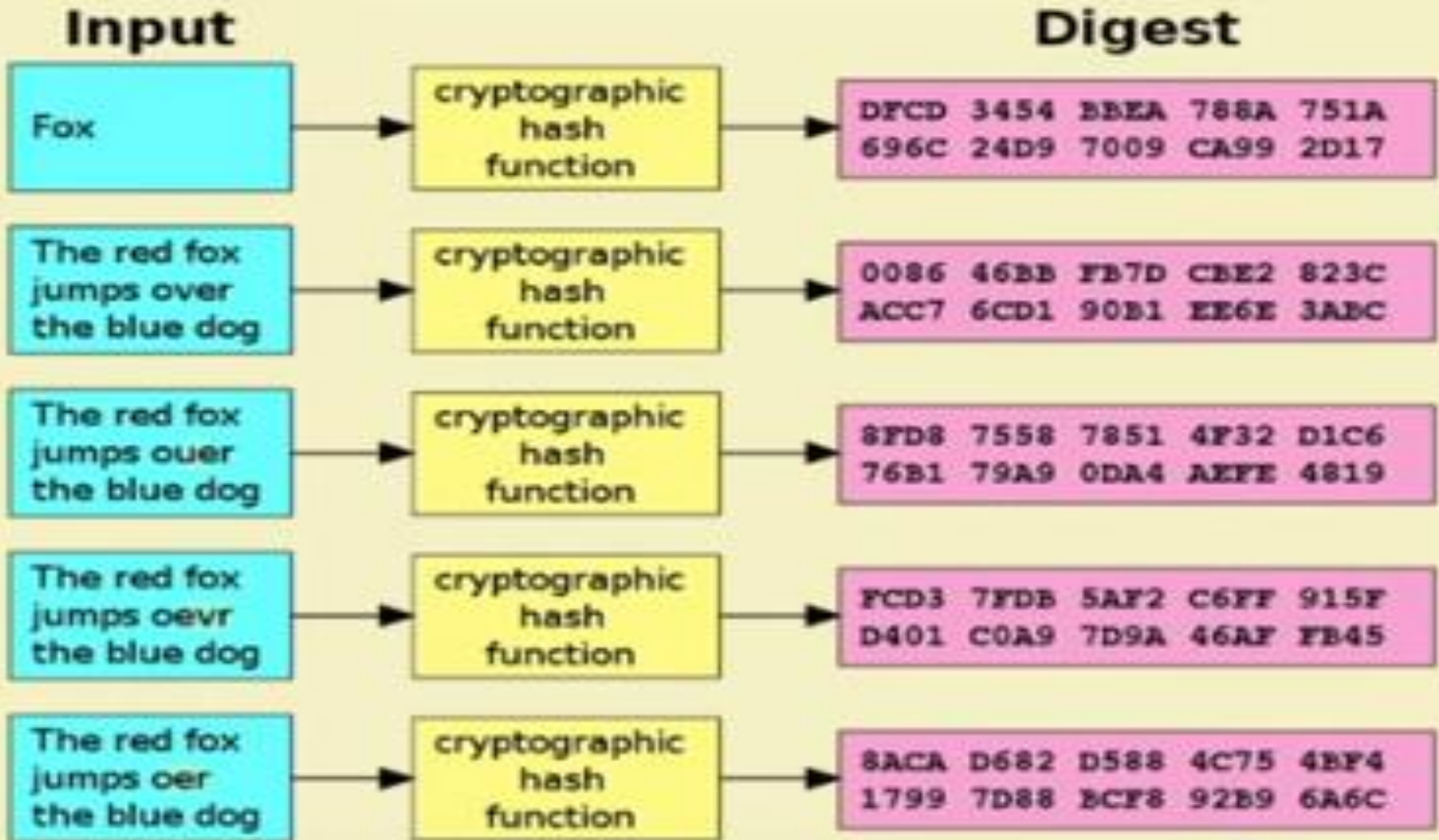


Image source: Wikipedia

Small change in input → large change in output



1. *Registration of fisherman by NGO.*



2. *Item attribute confirmation by NGO. Attributes tested include Fair Trade USA, Pole and Line Foundation Association Member, GPS (working with Seatracker data).*



3. *Fisherman issues item.*



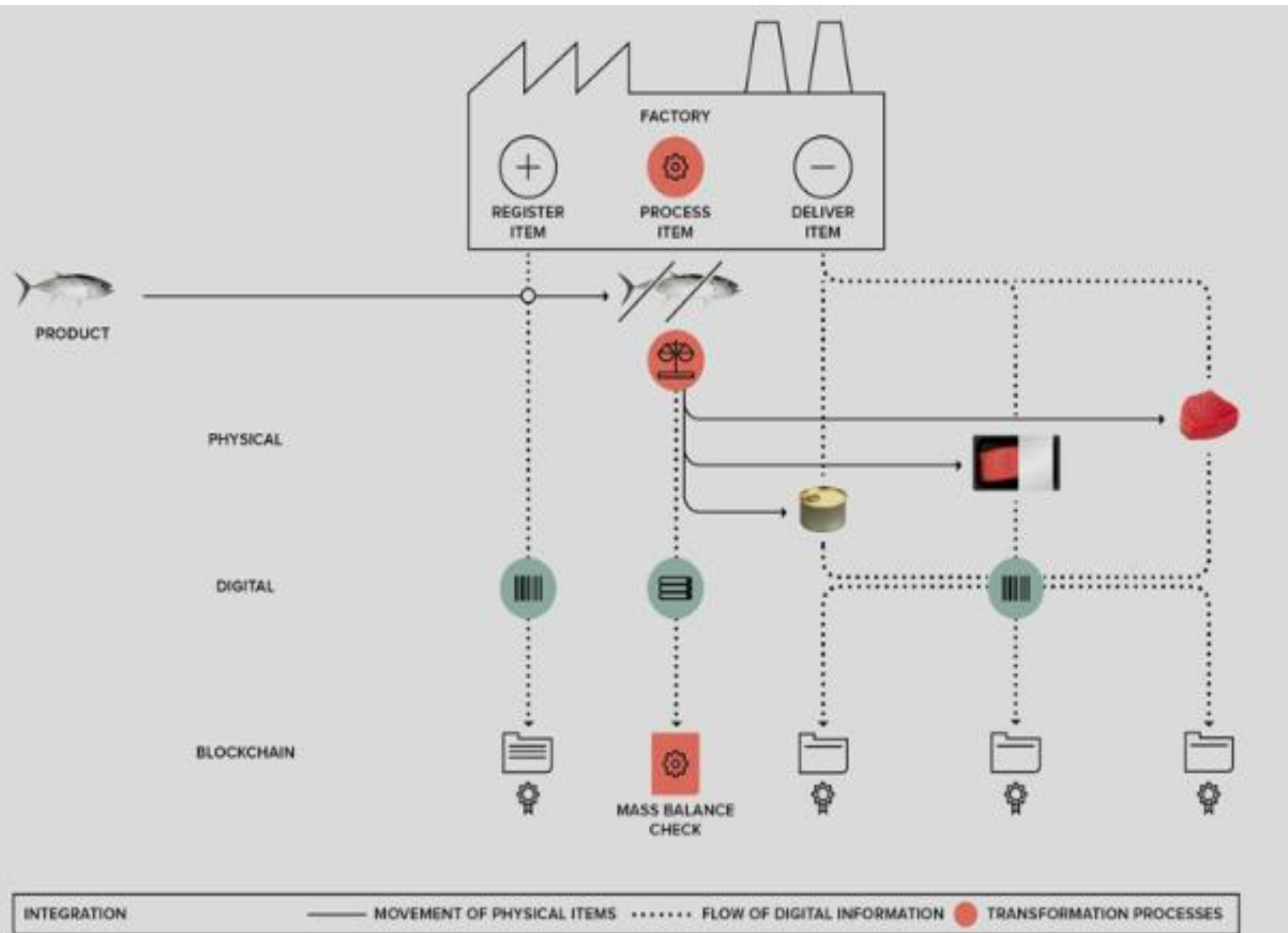
4. *Fisherman transfers the item to supplier.*



5. *Supplier receives the item.*



6. *Checking item on blockchain explorer.*





1. NFC-enabled smart stickers carry the Provenance mark along with item or batch IDs.



2. Touching a smartphone over the stickers shows the product's journey from sea to supermarket.



3. The stickers attach to a wide variety of packaging, functioning on both dry and chilled sections



4. Item tracking extends to dining environments, indicating available information on ingredients.



5. Bespoke items such as smart menus can be designed and developed by Provenance for premium brands.



# Enterprise Architecture

- The ideal strategic and operational control framework
  - Talks about business / organisation goals
  - Lists Current state of ICT
  - Figures out how mature current ICT is
  - Plans how to bring all ICT – current and future together