

Managing Data and its Implications

Lecture Title: What is Data?



Lecturer: Angelito Sciberras

Date: 21 February 2026

Undergraduate Diploma

Self-Assessment - Session 01



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What is Data?



Data

- "datum," which means "something given."
- plural form of "datum" is "data," but some people still use "data" as a singular noun
- in the early days of computing, "data" referred specifically to numerical values that were processed by machines.

Data

- today include any kind of information that can be processed by computers, including text, images, and video.
- often used interchangeably with other terms like "information" and "knowledge"
- as technology continues to advance, the definition and scope of "data" will likely continue to evolve.



Data

- facts
- figures
- measurements
- amounts
- descriptive information

that we gather for **analysis** or **reference**



Data

Factual information used as a basis for

- reasoning
- discussion
- calculation
- publishing
- decision-making



Data

“facts or information, especially when examined and used to find out things or to make decisions.”

- Oxford Dictionary





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Data

Qualitative vs Quantitative



Qualitative vs Quantitative

Qualitative Data (Descriptive)

- Non-numerical data
- Describes qualities, opinions, or characteristics
- Answers: “What type?” or “How does it feel?”

Examples

- Customer feedback comments
- Product reviews
- Employee opinions
- Brand perception (e.g., “good service”)



Qualitative vs Quantitative

Quantitative Data (Numerical)

- Numerical data that can be measured and counted
- Used for calculations and statistical analysis
- Answers: “How many?” or “How much?”

Examples:

- Number of sales = 250 units
- Monthly revenue = €10,000
- Customer age = 22 years
- Website visitors = 5,000



Qualitative Data



Give qualitative data about
the room we are in?

Quantitative Data



Give quantitative data about the room we are in?

Qualitative vs Quantitative Data

Your company is opening a Zoo in Malta. What qualitative and quantitative data will you collect to decide whether you should keep polar bears in the zoo?



Data

Qualitative

- describes things, i.e., it is descriptive information



Data

Qualitative



Appearance: Polar bears are typically white with black skin underneath. They have a large head, a long neck, and a stocky body with a thick layer of fur to help them stay warm in their cold environment.

Data

Qualitative



Behaviour: Polar bears are excellent swimmers and can travel long distances in search of food. They are also skilled hunters and can catch fish and other prey both on land and in the water. Polar bears are generally solitary animals, except for mating and raising cubs.

Data

Qualitative



Habitat: Polar bears live in the Arctic region and are adapted to living in a cold, snowy environment. They are often found on sea ice, where they hunt for food and rest. The melting of sea ice due to climate change is a major threat to the survival of polar bears.

Data

Qualitative



Importance: Polar bears play a crucial role in the Arctic ecosystem and are considered a keystone species. They help regulate the population of other animals, such as seals, and are an important cultural symbol for many indigenous communities in the Arctic.

Data

Qualitative



Other: social interactions, communication, or cultural significance.

Data

Quantitative

numerical information, i.e., numbers, statistics, measurements, etc.



Data

Quantitative



Size: Adult male polar bears can weigh up to 600-800 kg (1323-1764 lbs) and can reach a length of 2.4-3 meters (7.9-9.8 feet). Females are typically smaller, weighing up to 300-500 kg (661-1102 lbs) and reaching a length of 1.8-2.4 meters (5.9-7.9 feet).

Data

Quantitative



Population: The global polar bear population is estimated to be around 22,000-31,000 individuals, with the majority living in Canada. Polar bear populations are declining due to habitat loss and other threats from climate change.

Data

Quantitative



Diet: Polar bears primarily eat seals, but their diet can also include fish, birds, and other mammals. A single polar bear can consume up to 50 kg (110 lbs) of food in a single meal.

Data

Quantitative



Reproduction: Female polar bears give birth to litters of 1-4 cubs, usually in a den made of snow. Cubs stay with their mother for 1-2 years before becoming independent.

Data

Quantitative



Behaviour: Polar bears can swim for long distances and can hold their breath for up to two minutes. They are also capable of walking long distances over sea ice and can travel up to 50 km (31 miles) in a day.

Data

Quantitative



Other: information about their body temperature, heart rate, or metabolic rate.



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Data

Binary



Data



Data

Measuring Data



How is Data Measured?



Measuring Data

Types of data:

Text

Images

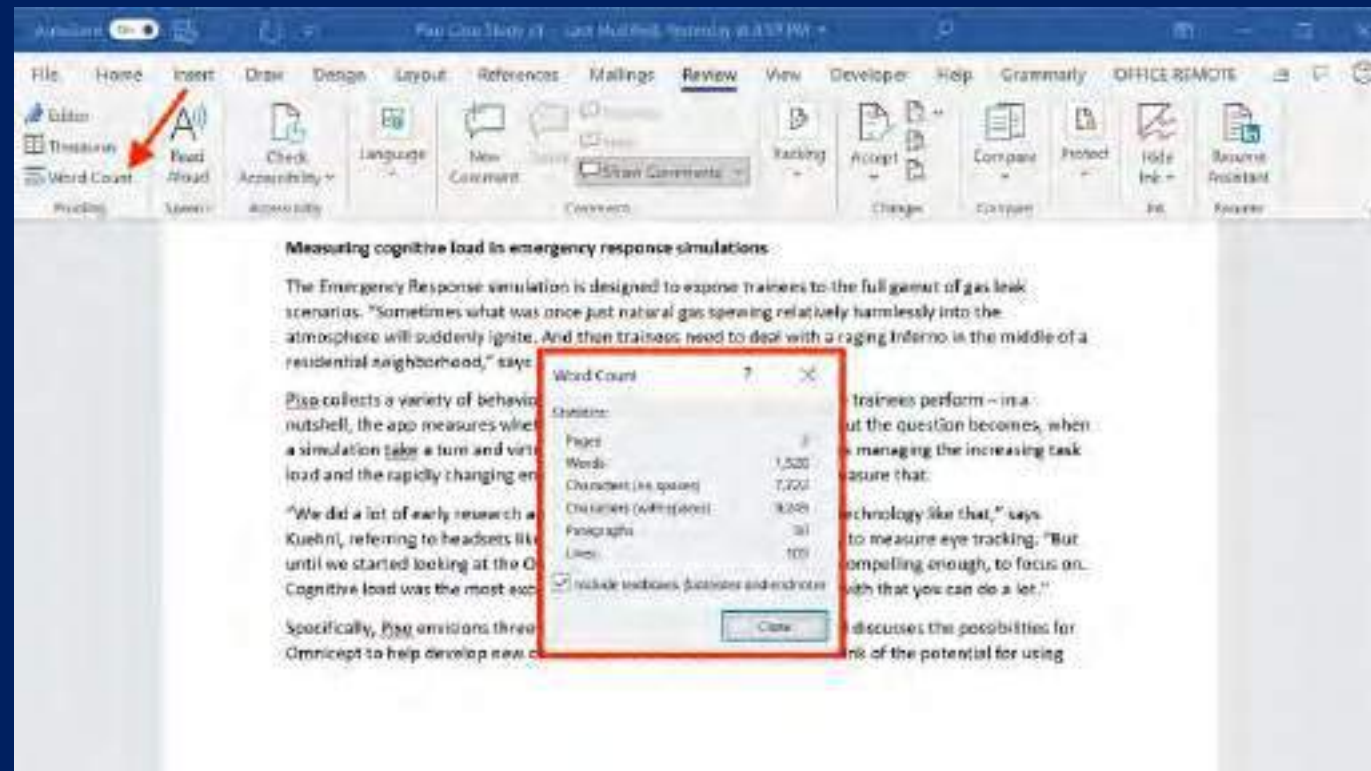
Audio

Video



Data

Text: Text data can be measured in terms of its length, typically using character or word counts.



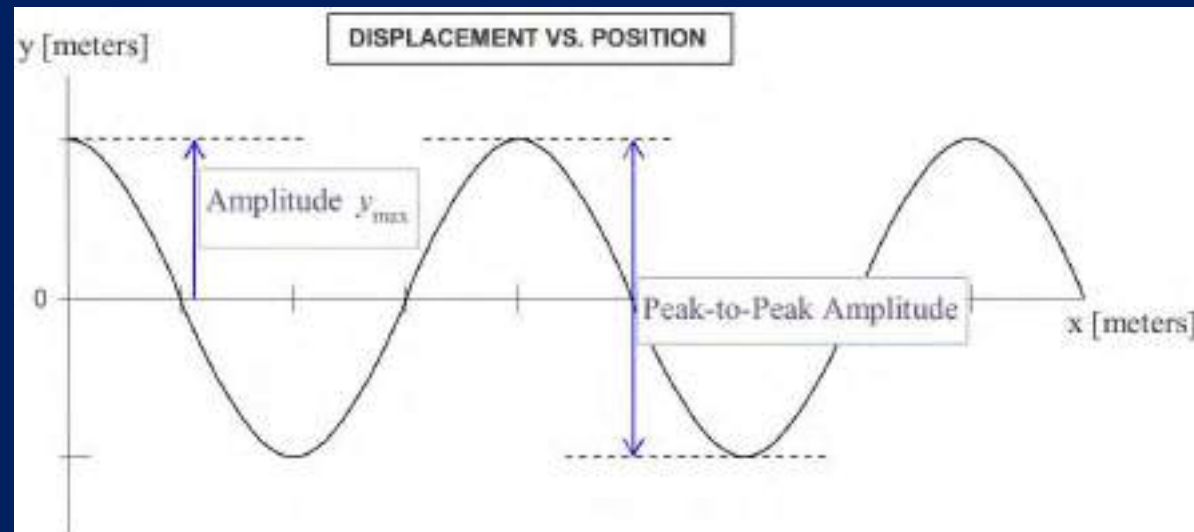
Data

Images: Image data can be measured in terms of its resolution, which refers to the number of pixels in the image.



Data

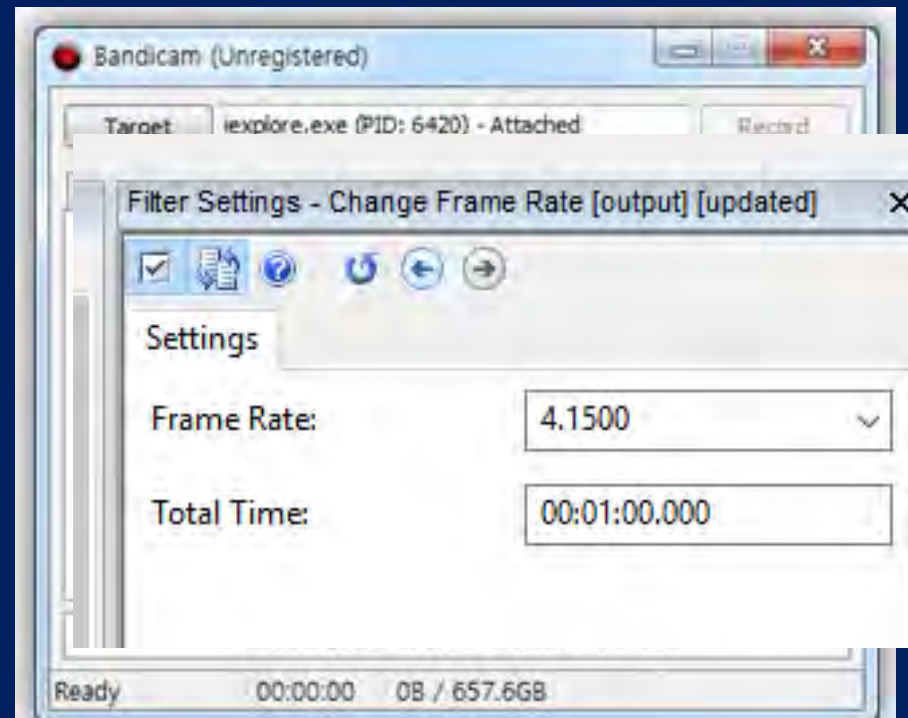
Audio: Audio data can be measured in terms of its frequency, amplitude, and duration.



[This Photo](#) by Unknown Author is licensed under [CC BY-SA-NC](#)

Data

Video: Video data can be measured in terms of its frame rate, which refers to the number of frames per second.



Data

data can also be measured in terms of its

- quality
- accuracy
- completeness

data is reliable and useful for its intended purpose





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Data

Storing Data



How is Data Stored?



Data Storage

Physical

Cabinets

Paper

Photographs

Magnetic Tape

Electronic

Flash Drives

CDs, DVDs, Blue Ray

Hard Drives

Servers



Data

Storage: units used to measure the size or capacity of digital storage devices such as hard drives, solid-state drives (SSDs), or flash drives.



Digital Storage



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Data

Computer bit and byte

A **bit** is a value of either a 1 or 0 (on or off).

Nibble

A nibble is 4 bits.

Byte

Today, a byte is 8 bits.

1 character, e.g., "a", is one byte.



Data

Megabyte (MB)

1,048,576 bytes or 1,024 kilobytes.

4 books (200 pages or 240,000 characters).

Gigabyte (GB)

1,024 megabytes, or 1,048,576 kilobytes.

4,473 books (200 pages or 240,000 characters).



Data

Terabyte (TB)

1,024 gigabytes, or 1,048,576 megabytes.

4,581,298 books (200 pages or 240,000 characters).



Petabyte (PB)

1,048,576 gigabytes, or 1,073,741,824 megabytes.

4,691,249,611 books (200 pages or 240,000 characters)



Data

Term	Capacity	Abbreviation
Bit	0 or 1 value	b
Byte	8 bits	B
Kilobyte	1024* bytes	KB
Megabyte	1024 KB	MB
Gigabyte	1024 MB	GB
Terabyte	1024 GB	TB
Petabyte	1024 TB	PB
Exabyte	1024 PB	EB
Zettabyte	1024 EB	ZB
Yottabyte	1024 ZB	YB





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Data

Big Data



Data

Big Data

- consists of at least **one petabyte** of information.



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Data

Big Data

sets of information that are **too large** or **too complex** to handle, analyse or use with standard methods



- - Oxford Dictionary



Data

Data can be called Big Data when it is:

Large in Volume.

Generated at high Velocity.

Comes in different Variety.



Data

The 7Vs of Big Data



Big Data

Volume

Refers to the vast amount of data generated every second.

Examples: Social media posts, financial transactions, IoT sensor data.

Challenge: Requires scalable storage and processing solutions.



4 petabytes of data daily



Big Data

Velocity

The speed at which data is generated, processed, and analysed.

Examples: Real-time stock market data, online transactions, streaming services.

Challenge: Requires fast processing technologies like stream processing and real-time analytics.

The VISA logo is displayed in a large, bold, blue font.

65,000+ transaction
messages per second



Big Data

Variety

Different types of data: structured, semi-structured, and unstructured.

Examples: Text, images, videos, social media posts, IoT data.

Challenge: Requires tools to integrate and manage diverse data formats.



Google Search handles text, images, videos, and voice searches



Big Data

Veracity

Refers to the quality and reliability of data.

Examples: Inconsistent social media data, inaccurate records.

Challenge: Requires data cleansing and validation techniques to ensure accuracy.



Fake News and
Misinformation

Big Data

Value

The usefulness and benefits derived from data.

Examples: Customer insights, fraud detection, business intelligence.

Challenge: Requires proper data analysis and interpretation to extract meaningful insights.



Big Data for personalised recommendations



Big Data

Variability

The inconsistency and changing nature of data over time.

Examples: Fluctuating customer sentiment, seasonal trends.

Challenge: Requires adaptive models and flexible analytics approaches.



Monitoring stock market fluctuations



Big Data

Visualisation

Presenting data in an understandable format using graphs, dashboards, and reports.

Examples: Heatmaps, charts, interactive dashboards.

Challenge: Requires effective tools to simplify complex data for decision-making.



Provides website traffic visualisations



Data

Volume

2,300,000 employees

37 million customers per day

Data of 145 million US customers

300,000 social mentions every week

2.5 petabytes of unstructured data from 1 million customers every hour

10,500 stores worldwide of which 4,500 in the USA



Data

Volume



Halloween sales

Special Cookie very popular in most stores

Two stores not selling any at all

Why?



Data

Variety

Data being stored and needs to be processed

- audio files
- video files
- Photos
- GPS data
- medical files
- instrument measurements
- Graphics
- web documents
- bonus cards
- internet search behaviour



Data

Variety

Predictability

Lookalikes

Identification of potential customers



Data

Velocity

involves the condition that you need to **process your data within minutes or seconds** to get the results you're looking for.



Data

Velocity

Every day, some **93,000 flights** take off from approximately **9,000 airports**. At any given time, there are **between 8,000 and 13,000 airplanes** in the air.

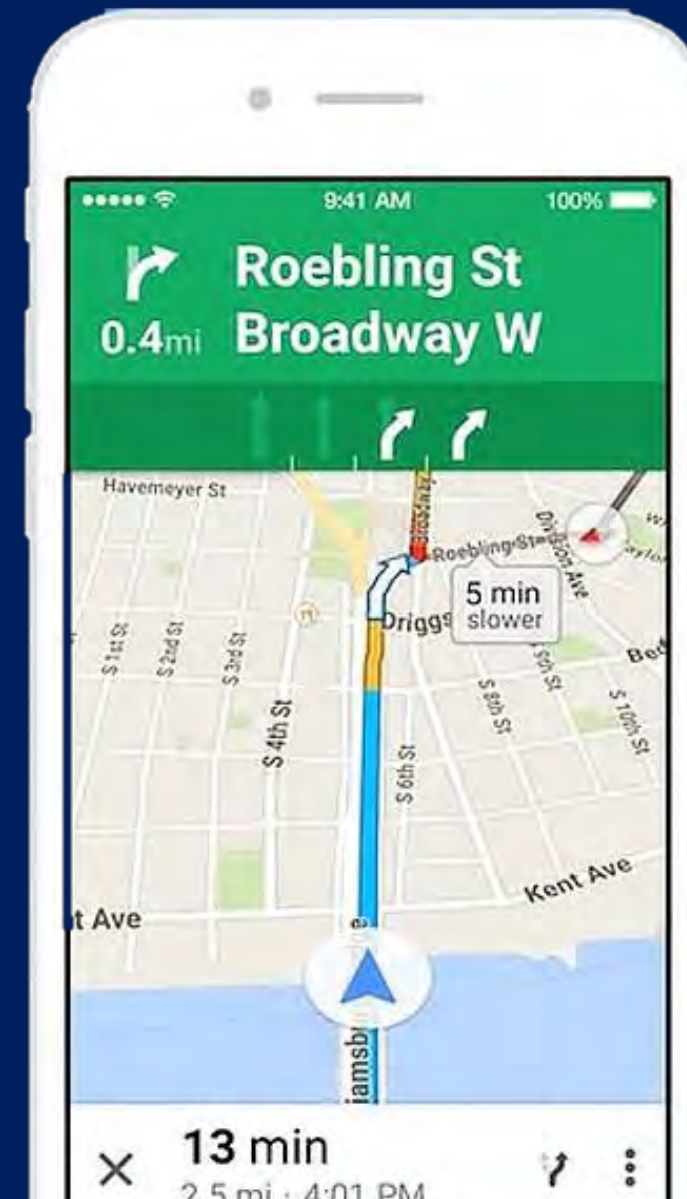


Data

Velocity

Can you imagine if the information is not real-time?

How does it work?



Data

Value

What value you can get from which data and how **big data gets better results** from stored data

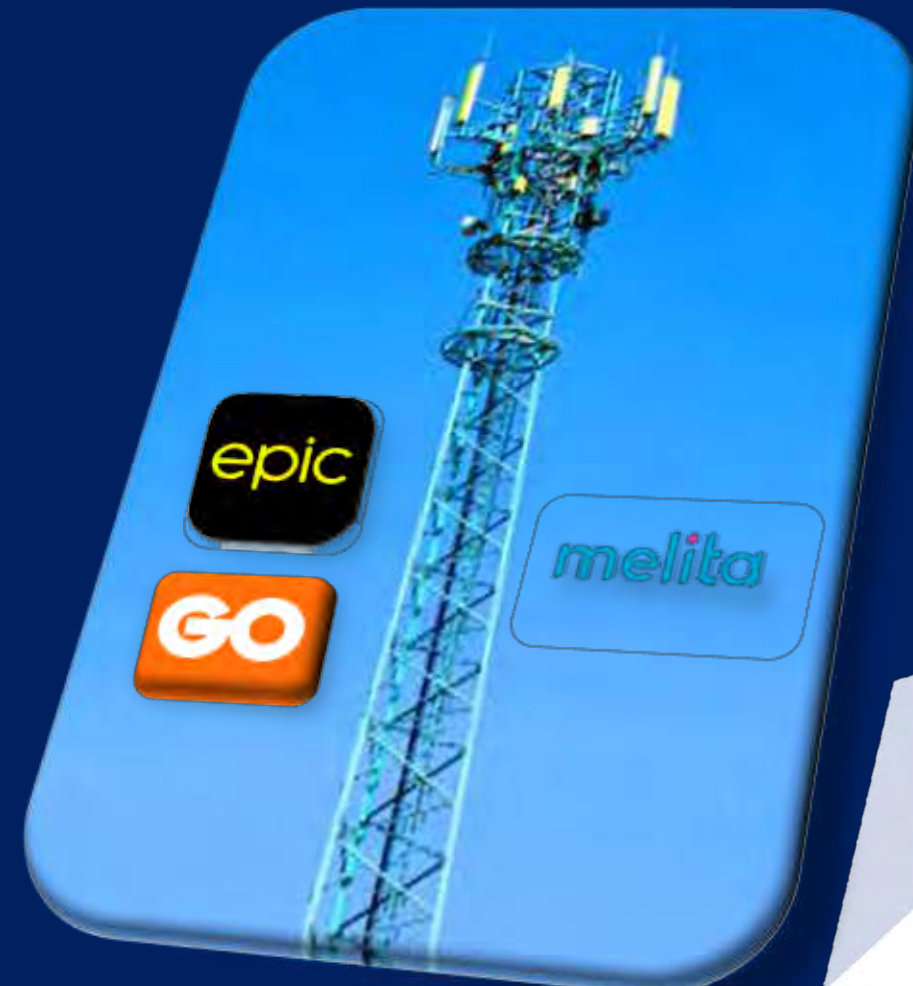
how meaningful the data



Data

Value

Identify customer location and
need for more infrastructure

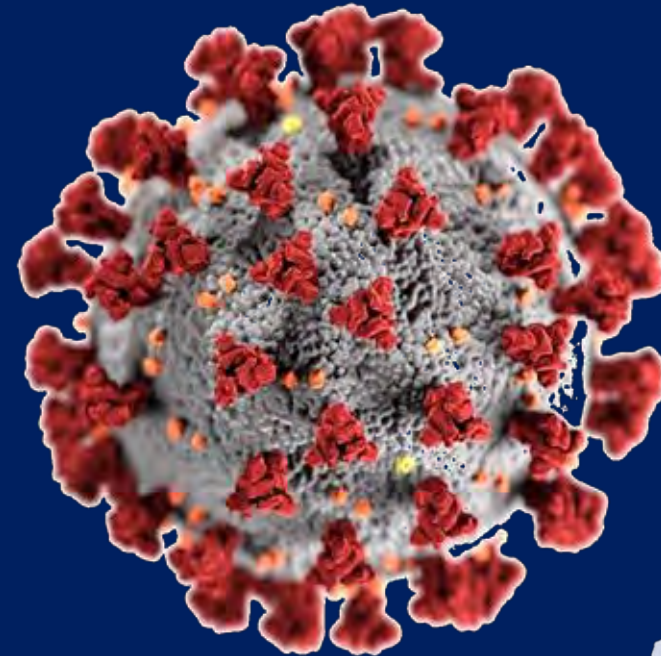


Data

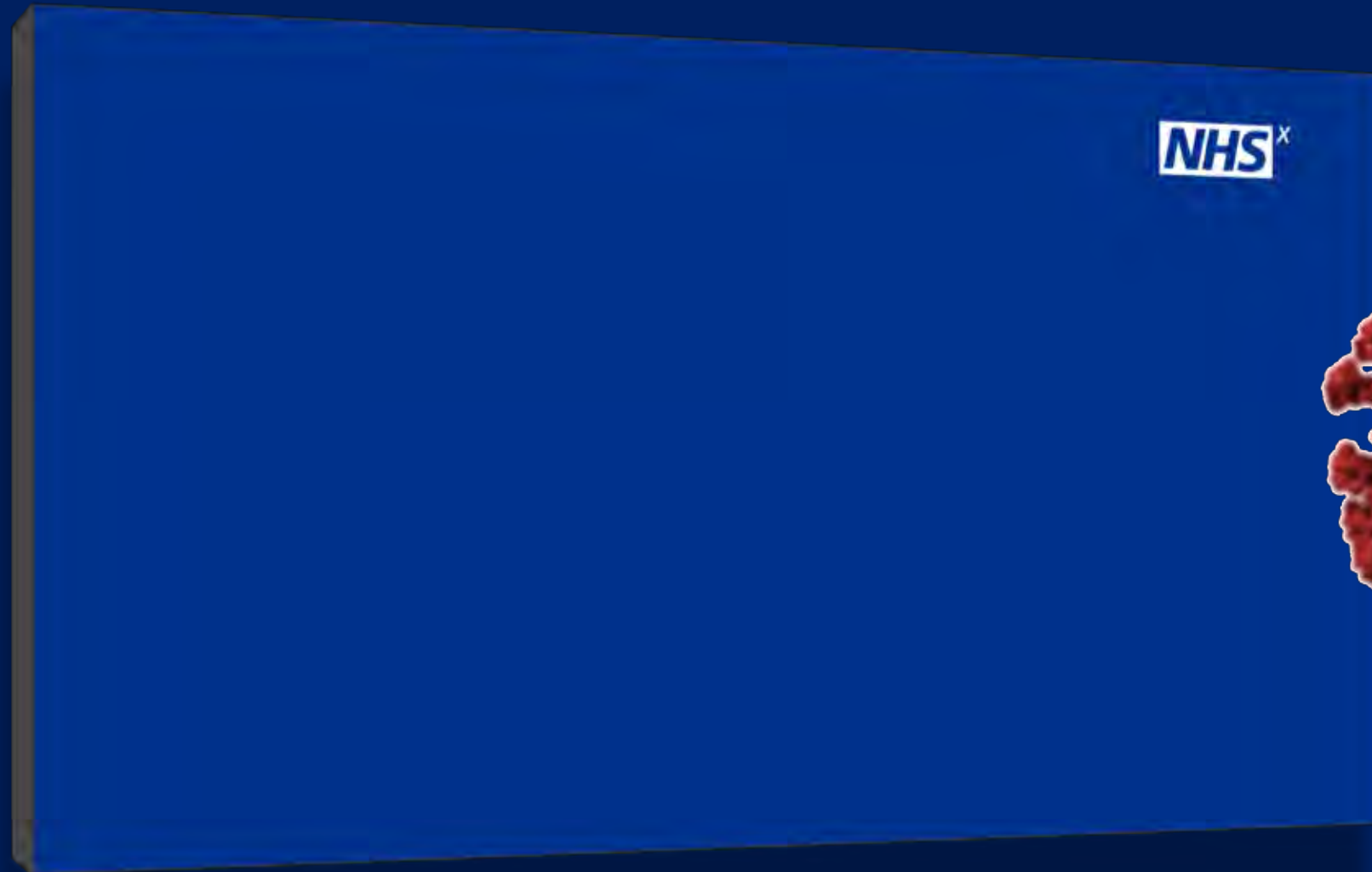
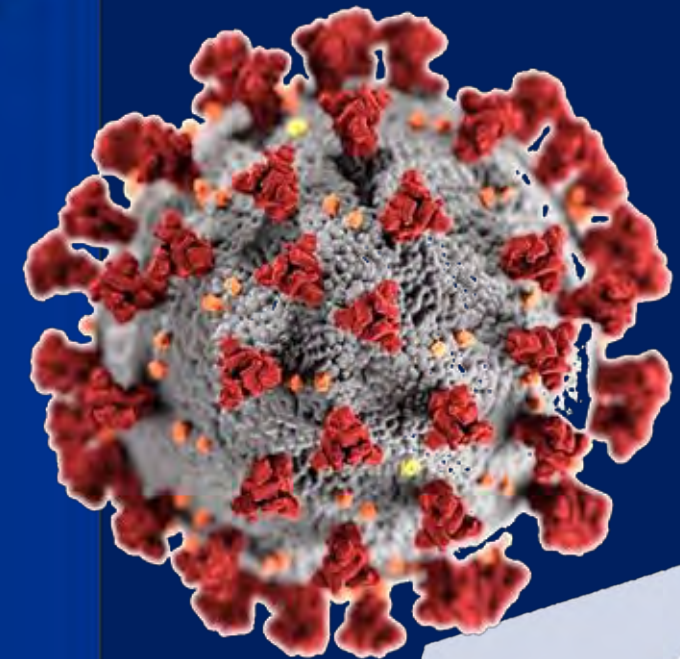
Veracity/Validity

the truth and authenticity of the data, and what can you do with it

the accuracy and reliability of the data



Data



Data

Variability

to what extent, and how fast, is the structure of your data changing?

And how often does the meaning or shape of your data change?

Can have an impact on the quality of data



Data

Visibility

degree of ease through which an enterprise can

monitor

display

analyse

data from disparate sources



Data

Visibility

The most important benefit is that you get **more data** from which to **make informed business decisions**



Data

- The average person generates **1.7 MB of data per second**.
- The world has **175 zettabytes*** of data as of 2025.
- **97.2%** of businesses are investing in big data and AI.

*175 ZB = 70 billion human brains worth of information!



Data

- The global big data market value is more than **\$131.4 billion (2025)** by annual revenue. This was \$56 billion in 2022.

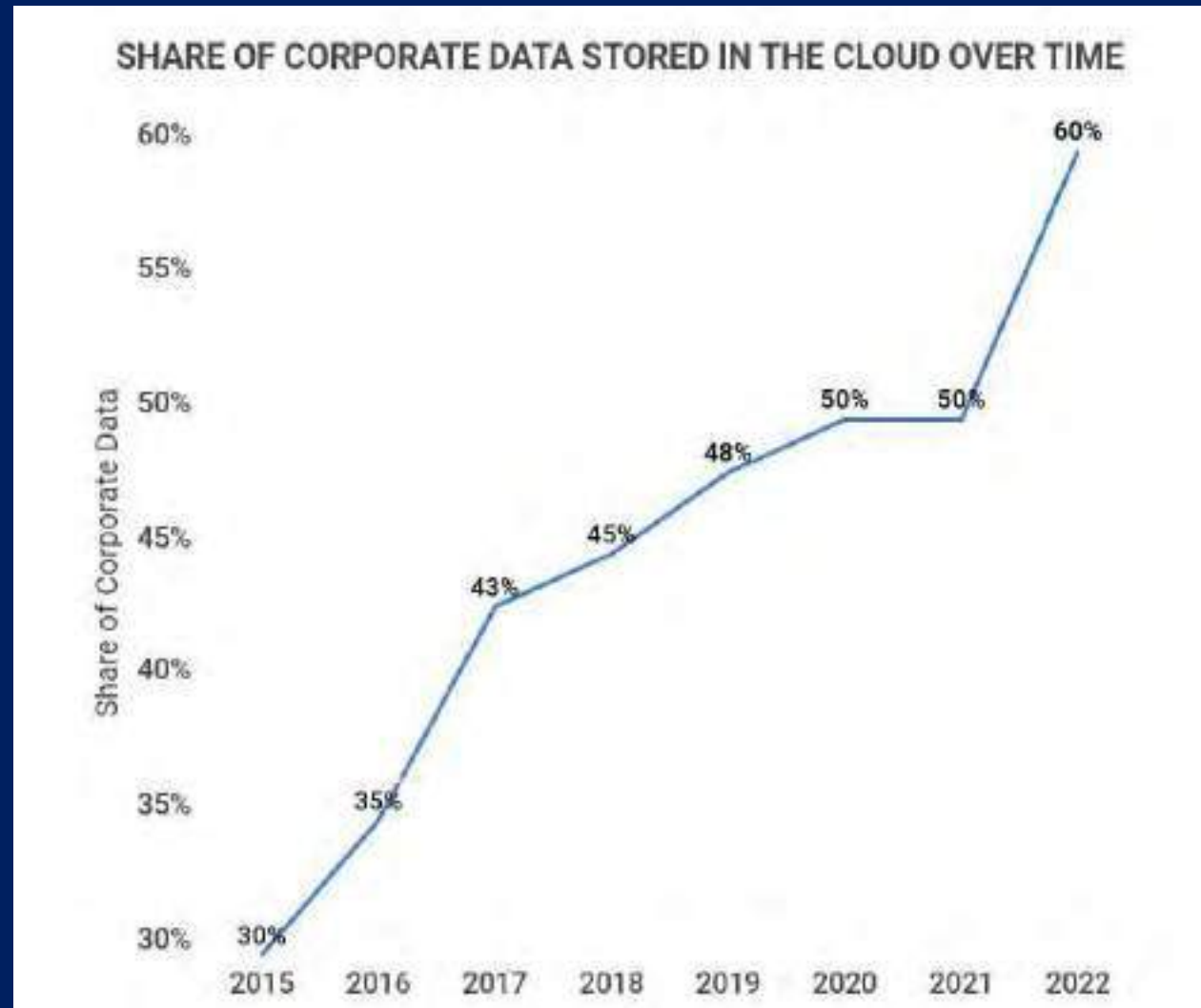


Data

- **90%** of the world's data has been created in the **last two years**.
- The global average cost of a data breach hit an all-time high of **€4.88 million** in 2024 - up almost 10% in two years
- As of 2024, **60%** of corporate data worldwide is **stored in the cloud**. It was only 30% in 2015.



Data



Data

- Companies that use big data solutions increase profits by an average of **8%**.
- **24%** of executives say they'd describe their companies as data-driven.
- **97.2%** of business executives say their organisations are investing in big data and AI projects.



Data

- The average company **doesn't use 60-73%** of its data for analytics.
- **95%** of businesses consider the need to manage unstructured data a problem they face
- Retailers that use big data fully can increase their **operating profits by 60%.**





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Data



Data

Is it Big Data or not?





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What Data do they collect about us?



Data Collected About You

Personal Information				
Name	data is collected	data is collected	data is collected	data is collected
Username	data not collected	data not collected	data is collected	data not collected
Password	data not collected	data not collected	data is collected	data not collected
Phone Number	data is collected	data is collected	data is collected	data is collected
Payment Information	data is collected	data is collected	data is collected	data is collected
Address	data not collected	data not collected	data is collected	data is collected
Social Security Number	data not collected	data not collected	data is collected	data not collected
Driver's license number	data not collected	data not collected	data is collected	data not collected
Email Address	data is collected	data is collected	data is collected	data not collected
Emails You Write and Receive	data is collected	data not collected	data not collected	data is collected
Stored Videos and Photos	data is collected	data is collected	data not collected	data not collected
Metadata of photos and files	data not collected	data is collected	data not collected	data not collected
Stored documents	data is collected	data not collected	data not collected	data not collected
Stored spreadsheets	data is collected	data not collected	data not collected	data not collected
Youtube comments	data is collected	data not collected	data not collected	data not collected
Contact info from devices	data not collected	data not collected	data not collected	data not collected

Data Collected About You

Unique Identifiers				
IP address	data is collected	data is collected	data is collected	data is collected
Crash reports	data not collected	data not collected	data not collected	data not collected
System Activity	data is collected	data not collected	data not collected	data not collected
Date, time and referrer URL of requests	data is collected	data not collected	data not collected	data not collected
Data about interactions between apps	data is collected	data not collected	data not collected	data not collected
Browser type	data is collected	data not collected	data is collected	data not collected
Device type	data is collected	data not collected	data not collected	data is collected
Application version number	data is collected	data not collected	data not collected	data not collected
Carrier name	data is collected	data not collected	data not collected	data not collected
Operating system	data is collected	data not collected	data is collected	data is collected

Data Collected About You

Activity				
Search Terms	data is collected	data not collected	data is collected	data is collected
Networks/ Connections	data not collected	data is collected	data not collected	data not collected
Messages	data not collected	data is collected	data not collected	data not collected
Content	data not collected	data is collected	data not collected	data not collected
Videos Watched	data is collected	data is collected	data is collected	data not collected
Views and Interactions with Content and Ads	data is collected	data is collected	data not collected	data not collected
Video and Audio Information If Audio Features Are Used	data is collected	data not collected	data not collected	data not collected
Time, Frequency and Duration of Activity	data is collected	data is collected	data not collected	data is collected
Purchase Activity	data is collected	data not collected	data is collected	data not collected
Reviews	data not collected	data not collected	data is collected	data not collected
People You Communicate/ Share Content With	data is collected	data is collected	data not collected	data not collected
Activity on Third-Party Sites and Apps	data is collected	data not collected	data not collected	data not collected
Browsing History	data is collected	data not collected	data is collected	data not collected
Calling-Party Number	data is collected	data not collected	data not collected	data not collected
Receiving Party Number	data is collected	data not collected	data not collected	data not collected
Forwarding Numbers	data is collected	data not collected	data not collected	data not collected
Times and Dates and Calls of Text	data is collected	data not collected	data not collected	data not collected
Call Duration	data is collected	data not collected	data not collected	data not collected
Routing Information	data is collected	data not collected	data not collected	data not collected
Types of Calls	data is collected	data not collected	data not collected	data not collected
Privacy Settings	data not collected	data not collected	data not collected	data not collected

Data Collected About You

				
Time Zone	data not collected	data not collected	data not collected	data is collected
GPS	data is collected	data not collected	data is collected	data is collected
Sensor Data From Device	data is collected	data is collected	data is collected	data not collected
Information About Things Near Device (i.e Wi-Fi Acc Bluetooth-enabled Devices, etc.)	data is collected	data not collected	data not collected	data not collected
Publicly Accessible Sources				
Local Newspapers	data is collected	data not collected	data not collected	data not collected
Third Party Marketing Partners	data is collected	data not collected	data is collected	data not collected
Advertisers	data is collected	data not collected	data is collected	data not collected
Credit History From Credit Bureaus	data not collected	data not collected	data is collected	data not collected

Data Collected About You



<https://adssettings.google.com>

Share with us what Google knows about you



Data



Company Data

- Sources
- Use
- Examples

Company Data

Sources

- Clients
- Service Providers
- Employees



Company Data

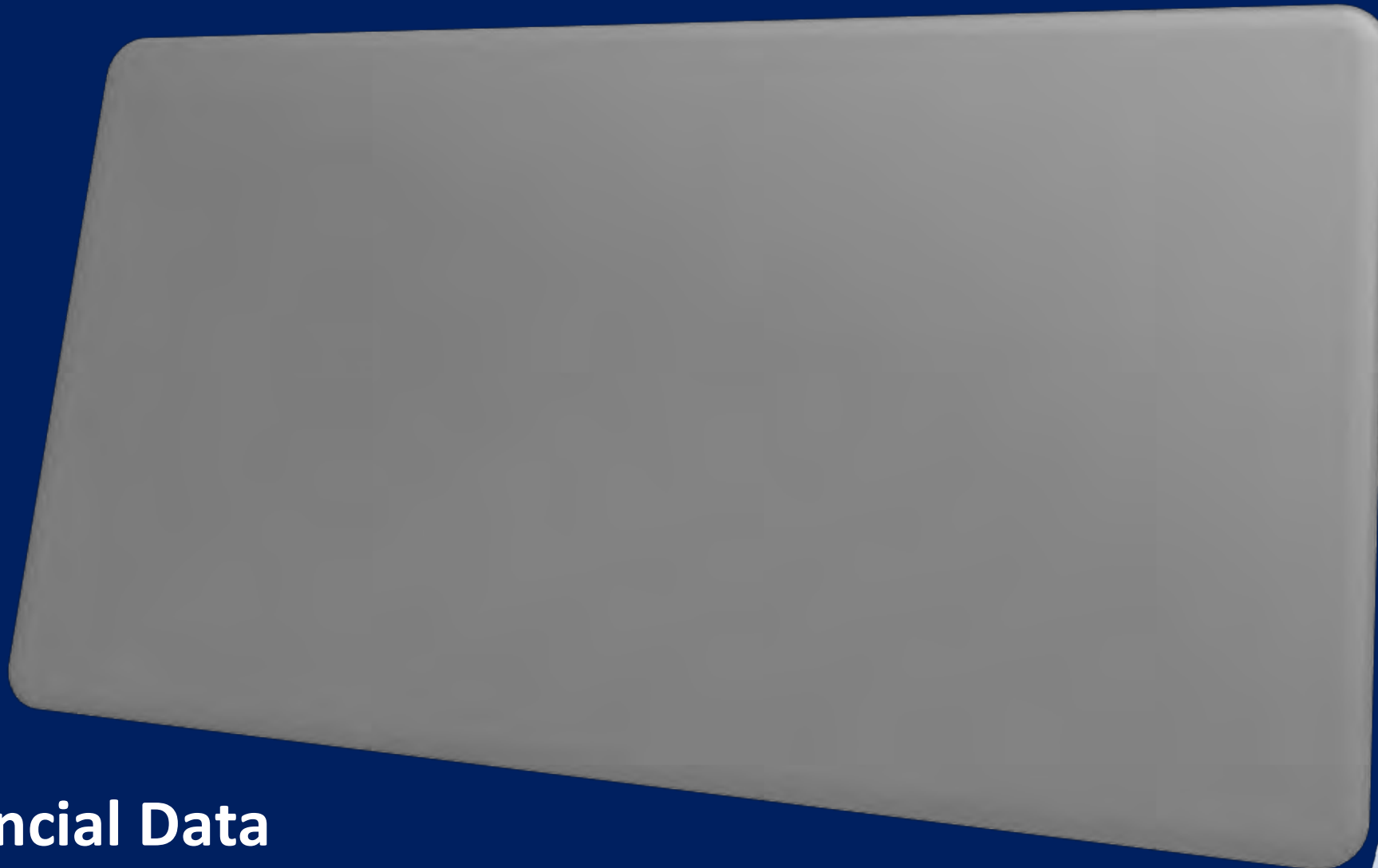
Sources

Clients Data:	Record Keeping
	Marketing
	Security

Service Providers:	Record Keeping
	Security



Company Data - Clients & Service Providers



Financial Data



Company Data - Employment

- Personal contact details such as name, title, addresses, telephone numbers, and personal email addresses.
- Date of birth.
- Gender.
- Marital status and dependants.
- Next of kin and emergency contact information.
- National Insurance number.
- Bank account details, payroll records and tax status information.
- Salary, annual leave, pension, and benefits information.
- Start date.
- Location of employment or workplace.
- Copy of driving licence.
- Recruitment information (including copies of right to work documentation, references and other information included in a CV or cover letter or as part of the application process).
- Employment records (including job titles, work history, working hours, training records and professional memberships).
- Compensation history.
- Performance information.
- Disciplinary and grievance information.
- CCTV footage and other information obtained through electronic means such as telephone calls' recordings.
- Information about your use of our information and communications systems.
- Photographs

Company Data - Employment



Recruitment

Company Data - Employment



Monitoring

Company Data - Employment



HRM

Company Data - Marketing



Mailchimp



Company Data - All



Security

Company Data - All



Fleet Tracking

Where is this data?

Media

- Paper
- Optical
- Magnetic
- Solid State
- Network Attached Storage (NAS)
- Cloud Storage



Where is this data?



Types of storage media

Paper, optical, magnetic, & solid state

Where is this data?

Media

- Paper
- Optical
- Magnetic
- Solid State
- Network Attached Storage (NAS)
- Cloud Storage



Where is this data?



Tomorrow's company's



Metaverse

What is Metaverse?



Tomorrow's company's



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