Information and data principles - 01

Data principles

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Data vs information

Data

- **Data** is disorganised, not typically useful on its own and generally includes the raw forms of numbers, statements and characters. **Data generation** refers to the collection of data.

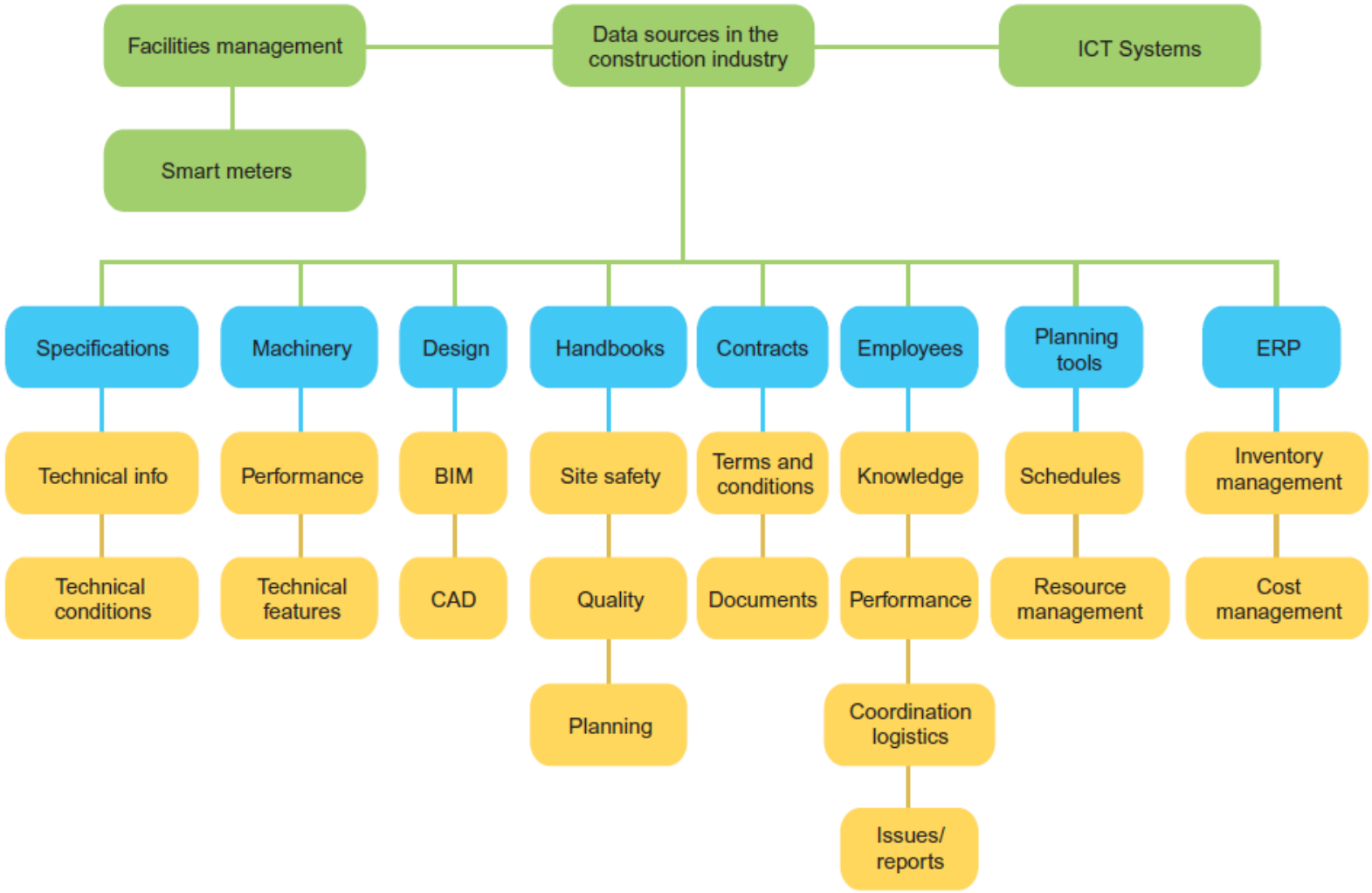
Information

- **Data processing** refers to the collection and manipulation of data, thus producing **information**.

Data sources used in construction

The construction industry is an information-intensive environment.

As you can see, collaboration between parties is fundamental to the success of a construction project.



Key elements of data

When handling data used to inform construction and building services processes, there are some key considerations and principles to understand.

- **Accuracy:** data can be gathered, stored and used in construction projects to inform crucial decisions, for example about a project's cost, time schedules, workflows and how the building is eventually used. Therefore, it is crucial that the data collected is accurate and that it is handled correctly, as inaccurate data can cause grave problems that affect a project's success, such as incorrect materials used due to an inaccurate specification.

- **Generalisation** is a process of zooming out to get a broader view of a problem, trend or situation. It is also known as **rolling-up data**.

Key elements of data

- **Interoperability:** technology systems and devices should exchange, interpret and store data using common standards. This enables data to be shared easily. Two systems are **interoperable** if they can exchange data and present it in a way that is useful to construction teams.

- **Level of detail (LOD):** information can be both graphical and non-graphical. LOD is the term used for the amount of detail within a model. The LOD required may vary at different points in the process. Defining the LOD is a requirement of the building information modelling (BIM) process.

- **Metadata** means ‘data about data’. Metadata is defined as the data providing information about one or more aspects of the data. It is used to summarise basic information about data, which can make tracking and working with data easier.

How data is used

Data from many sources can be used to:

- **understand behaviour**, eg how workers use an office building
- **assess performance**, eg energy usage, how ‘green’ a building is, its longevity, etc
- **improve market competitiveness**, eg make construction projects run efficiently to time and budget
- **allocate resources**, eg show how work can be allocated and scheduled and how construction workers’ time should best be used.

The following slides look at the different sources of data and from where data is generated.

ICT systems and equipment

In the modern age, most data is collected using **ICT (information and communications technology)**. Equipment used to collect data includes:

- robotic total stations (surveying equipment for laying out a site)
- scanners
- drones
- sensors
- mobile phones
- tablets
- digital cameras.

Surveying devices

A **robotic total station (RTS)** is an electronic transit theodolite integrated with **electronic distance measurement (EDM)** to measure both vertical and horizontal angles and the slope distance from the instrument to a particular point. An on-board computer collects data and performs triangulation calculations.

Surveying devices

Virtual surveying using a drone
https://youtu.be/JMv61HpdR2c

Laser scanner
https://share.vidyard.com/watch/2CFpwg7Anvd3hfeetZj36i

Rotary laser level

3D camera systems

Three-dimensional (3D) camera systems can be used to create virtual tours of a space. They can capture images, collect measurements and process data to create, edit and share a 3D rendering of the location. This can also be integrated into BIM technology. It can be used throughout a project – for example, to allow engineers to view the site in accurate detail without needing to make repeated visits.

For example, **Matterport** is a 3D camera system which can be used to document a building or property in 3D.

https://youtu.be/aHuHNjdrdHs

Data manipulation

Systems can integrate data from other applications such as 3D modelling software to create models for visualisation and client/contractor engagement onsite, which allows:

- surveying of the site
- progress monitoring
- collaboration
- remote support.

An example would be Trimble SiteVision which allows different parties to collaborate using the visual data. See the links below.

https://youtu.be/N2bfZUvyoBw

https://youtu.be/YPSX0GjB7dw

Data manipulation

When data is downloaded from a total station onto a computer, **application software** can be used to compute results and generate a map of the surveyed area.

The points, dots, lines and coordinates that are collected during the survey(s) can be used by **computer aided design (CAD)** software packages and BIM systems to develop 2D designs and 3D models.

BIM

Building information modelling (BIM) is an intelligent 3D model-based process. The stages of BIM are shown below.

- **Plan:** combine the reality capture and real-world data to generate models of the existing built and natural environment.
- **Design:** conceptual design, analysis, detailing and documentation are performed. This pre-construction model provides data that can inform the scheduling and logistics of the project.
- **Build:** using the BIM specs, the project construction phase begins. Project construction logistics are shared with trades and contractors to optimise the schedule most efficiently.
- **Operate:** after handover, BIM carries over to operations and maintenance of finished builds. It can also provide data for renovation and deconstruction.

Benefits of BIM

- **Plan:** capturing real-world data about environments ensures accurate coordination and collaboration.
- **Design:** using the 3D captured data to inform design provides quicker and higher levels of customisation and flexibility, and optimisation of the schedule and costs.
- **Build:** the BIM specification and logistic data allow for quick conflict detection and risk mitigation.
- **Operate:** using the BIM data makes schedules for maintaining the asset for its life cycle easier.

For more information see: https://youtu.be/s1yN-LMs_jU

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Any Questions

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Activity

Group Activity

Grouper

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Assessment

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