

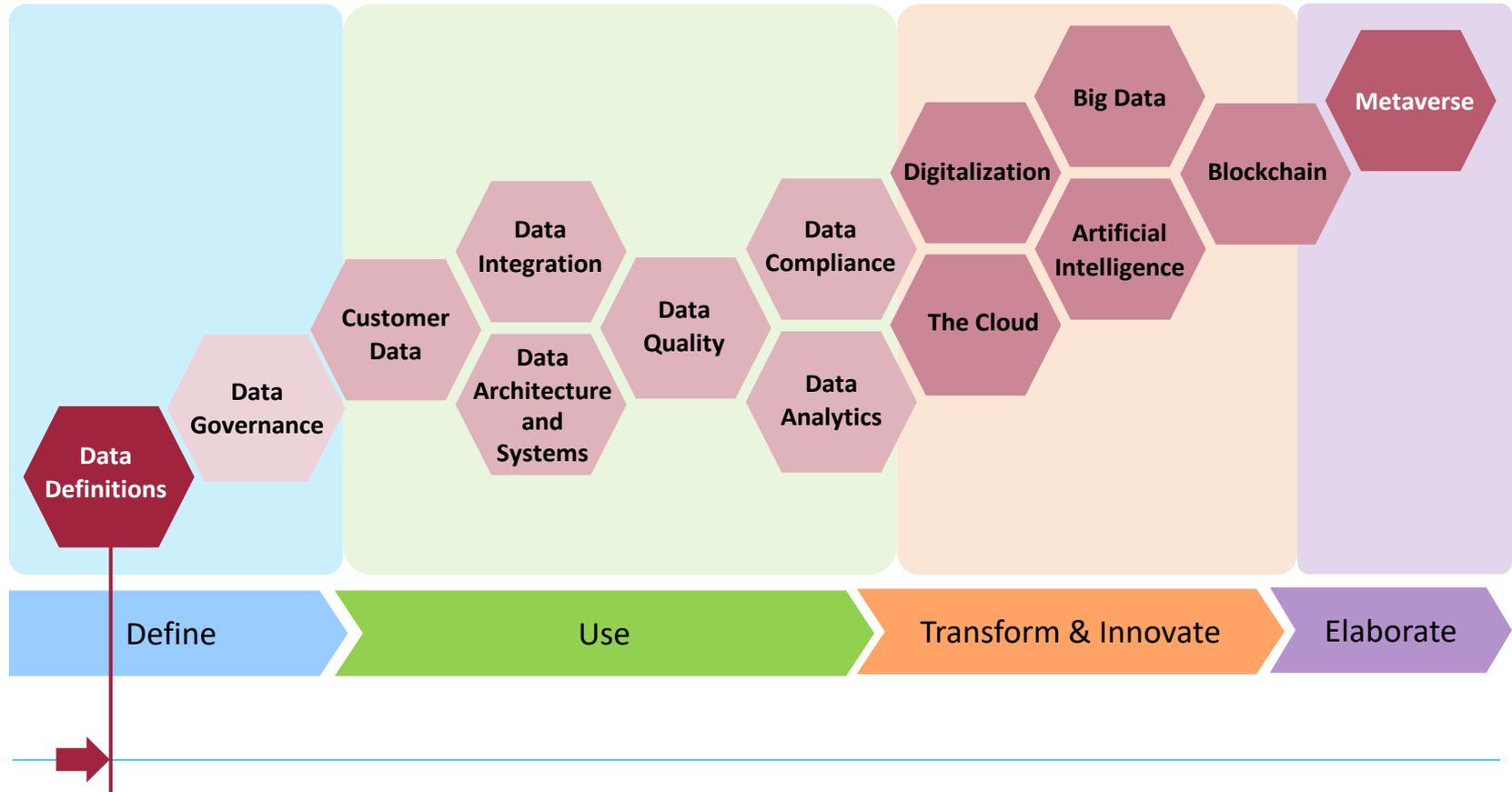
Data Definitions



KNOW*Data*



January 11, 2026
Lionel Pilorget





Data Definitions

Data and Information

Data

Information

Information
System

Database

Data Types and Lifecycle

Data Types

Metadata

Data Lifecycle

Data Management

Data as an Asset

Data Monetization

Servitization

Data
Management

What are Data?



- Data are raw facts or figures collected from various sources
- Data can be in the form of numbers, text, images, sound, or video





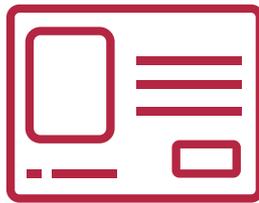
Printed reports



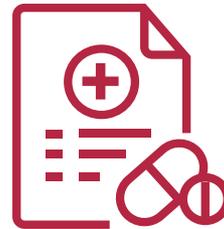
Invoices



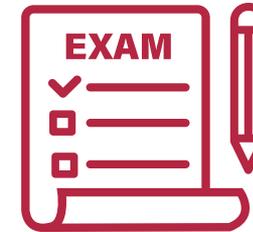
Manual



Official IDs



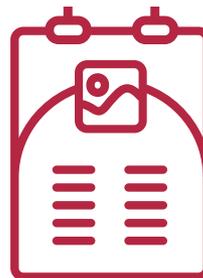
Prescription



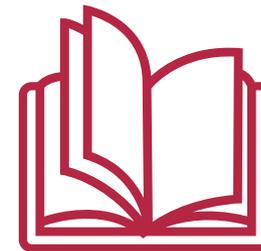
Printed questionnaire
for test



Photographs printed on
paper



Poster



Book



Type of data	most common file extensions
Text	.txt , .rtf, .doc, .docx, .pdf
Image	.bmp, .jpg, .jpeg, .gif, .png, .tif, .tiff, .webp
Audio	.mp3, .wav, .aac, .flac
Video	.mp4, .avi, .mov, .wmv, .mkv
Spreadsheet	.xls, .xlsx, .csv, .ods
Presentation	.ppt, .pptx, .odp, .pdf
Web	.html, .htm, .css, .js, .json, .xml
3D and CAD Files	.dwg, .obj, .stl, .blend
System and Configuration	.ini, .cfg, .log, .sys, .reg
Executable and Script	.exe, .app, .bat, .sh, .py, .js

Which data do you use?



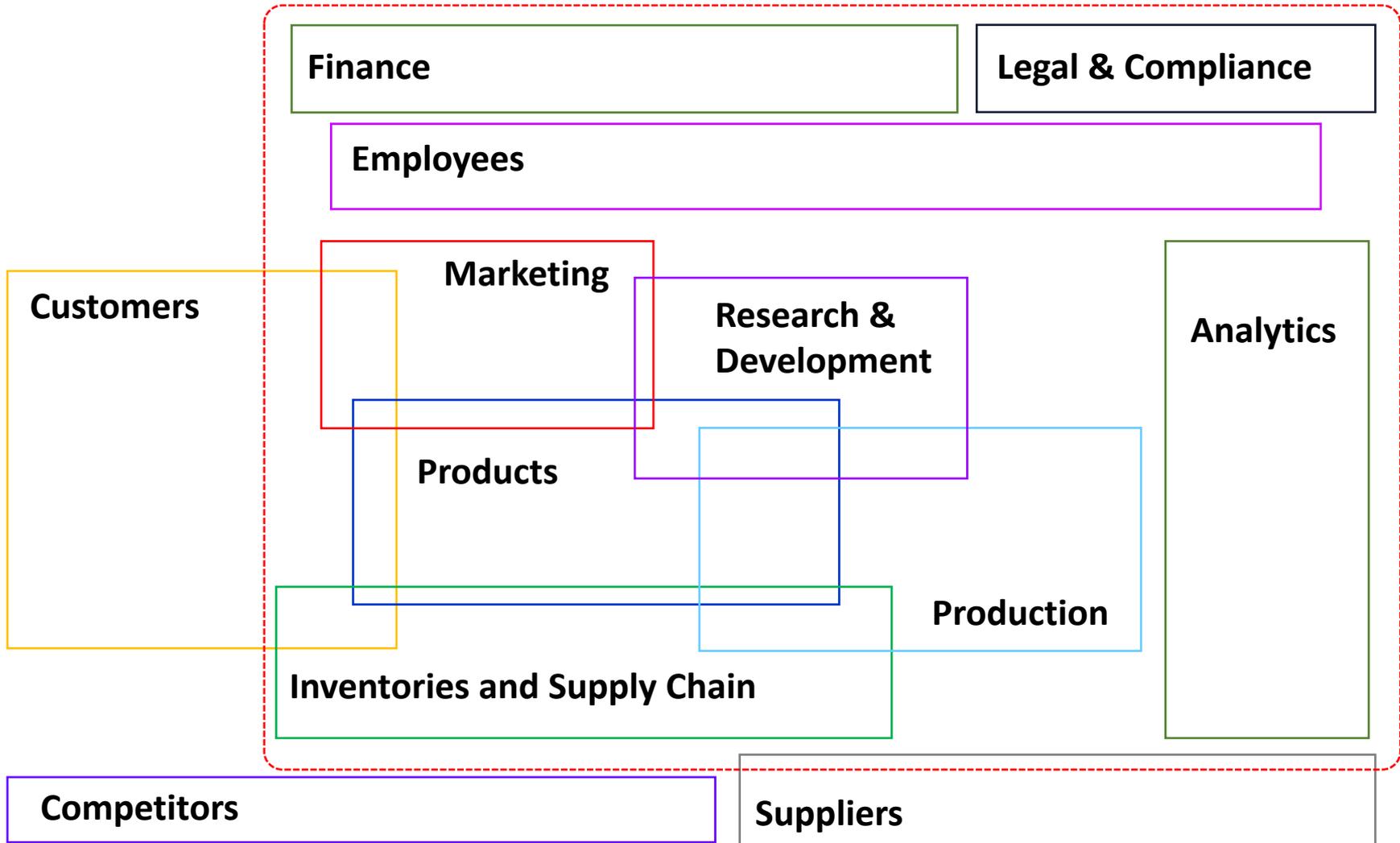
For private purposes



In your job



Key Data Areas in a Company





Customer (Person)

- Full Name
- Date of Birth
- Gender
- Contact Information
- Age
- Occupation
- Preferences
- Payment Methods
- ...

Products

- Product Information
- Purchase Details
- Pricing and Payment Terms
- Product Delivery
- Support and Maintenance
- ...

Employee

- Personal Information
- Employment Details
- Payroll and Compensation
- ...

Legal

- Contracts
- Litigation and Dispute
- ...

Supply Chain

- Inventory Management
- Logistics and Transportation
- ...

Customer (Company)

- Company Name
- Company Size
- Headquarter / Branch Locations
- Invoices and Payment Records
- Noga Code
- Contract Agreements
- ...

Suppliers

- Supplier Name
- Contact Information
- Product Catalogue
- Price Lists
- Minimum Order Quantities
- ...

R&D

- Technology Development
- Research Outputs
- Collaboration
- ...

Production

- Production Planning
- Bill of Materials
- Equipment and Machinery
- ...

Marketing

- Audience
- Campaign Performance
- Content
- ...

Competitors

- General Information
- Product Information
- Financial Data
- Online Presence
- Competitive Advantages
- ...

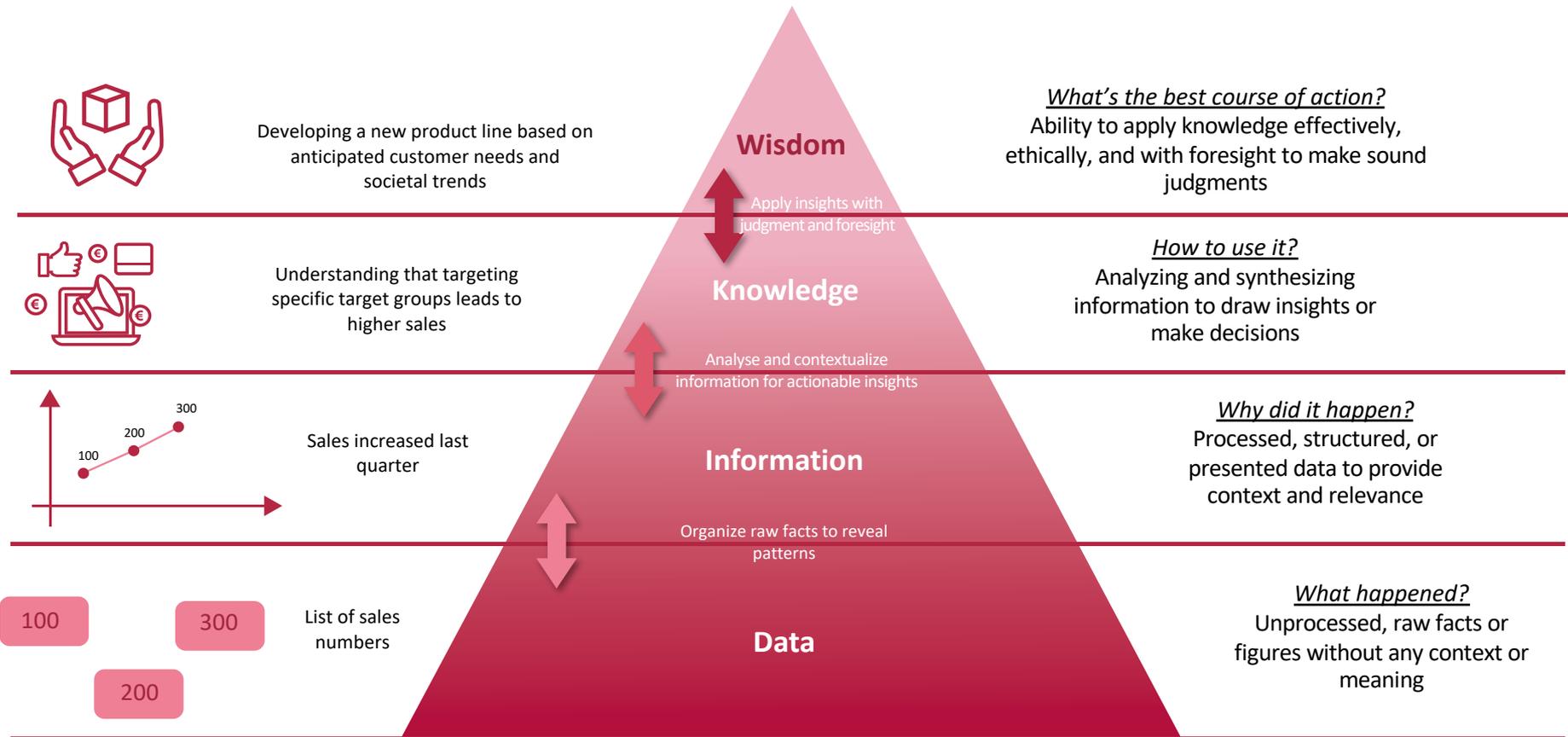
Finance

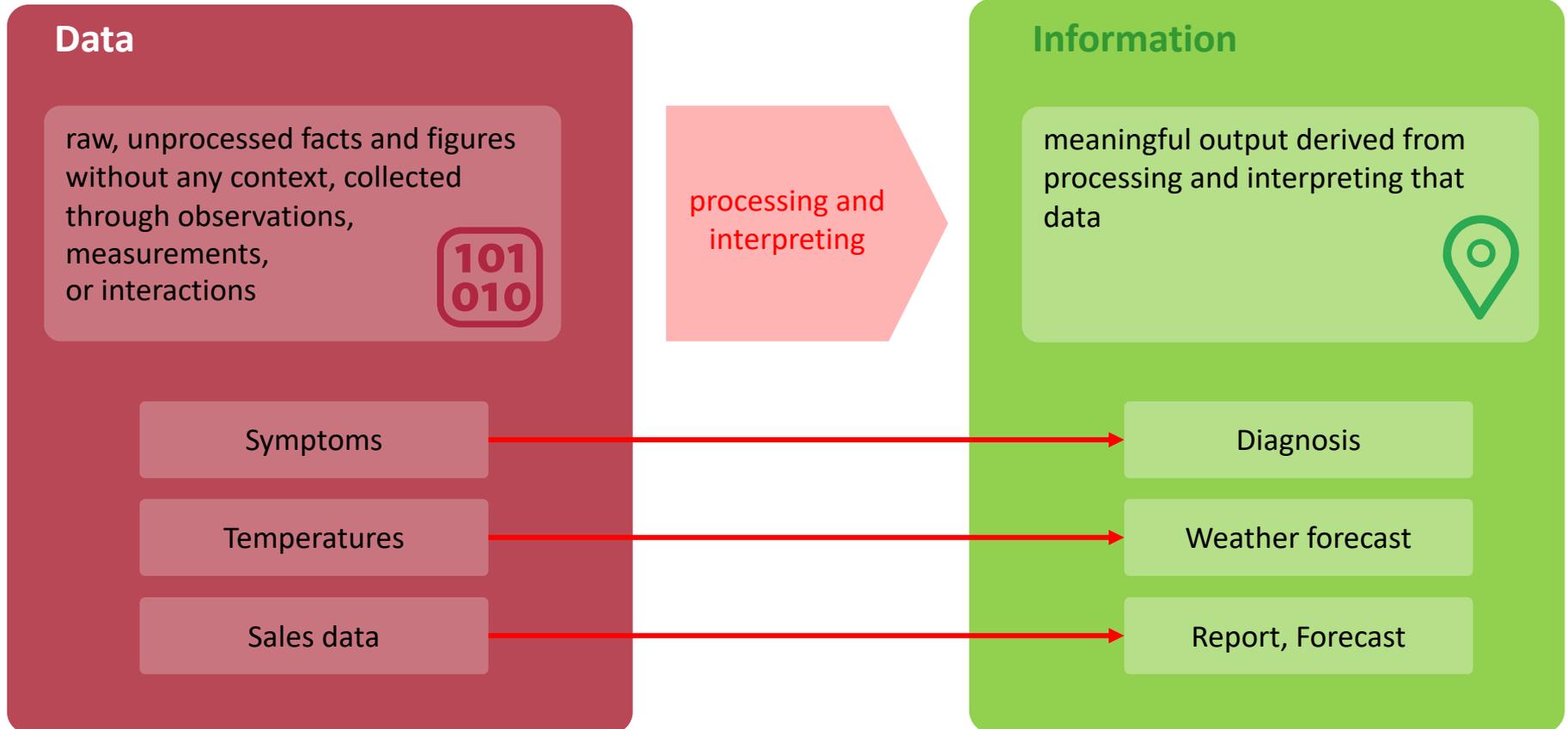
- Income and Revenue
- Debt and Financing
- Financial Statements
- ...

But what is the use of Data?



Data lead to Information, Information to Knowledge and Knowledge to Wisdom





What does this train ticket tell us?



Data

date

City names

Ticket number

Figure

Currency, Figure

Information

When do I have to leave?
What is my flexibility?

Distance and duration

Travel class

Ticket cost

Extra Information

Purpose

Frequency

Accompaniment

extra Luggage

Travel Details

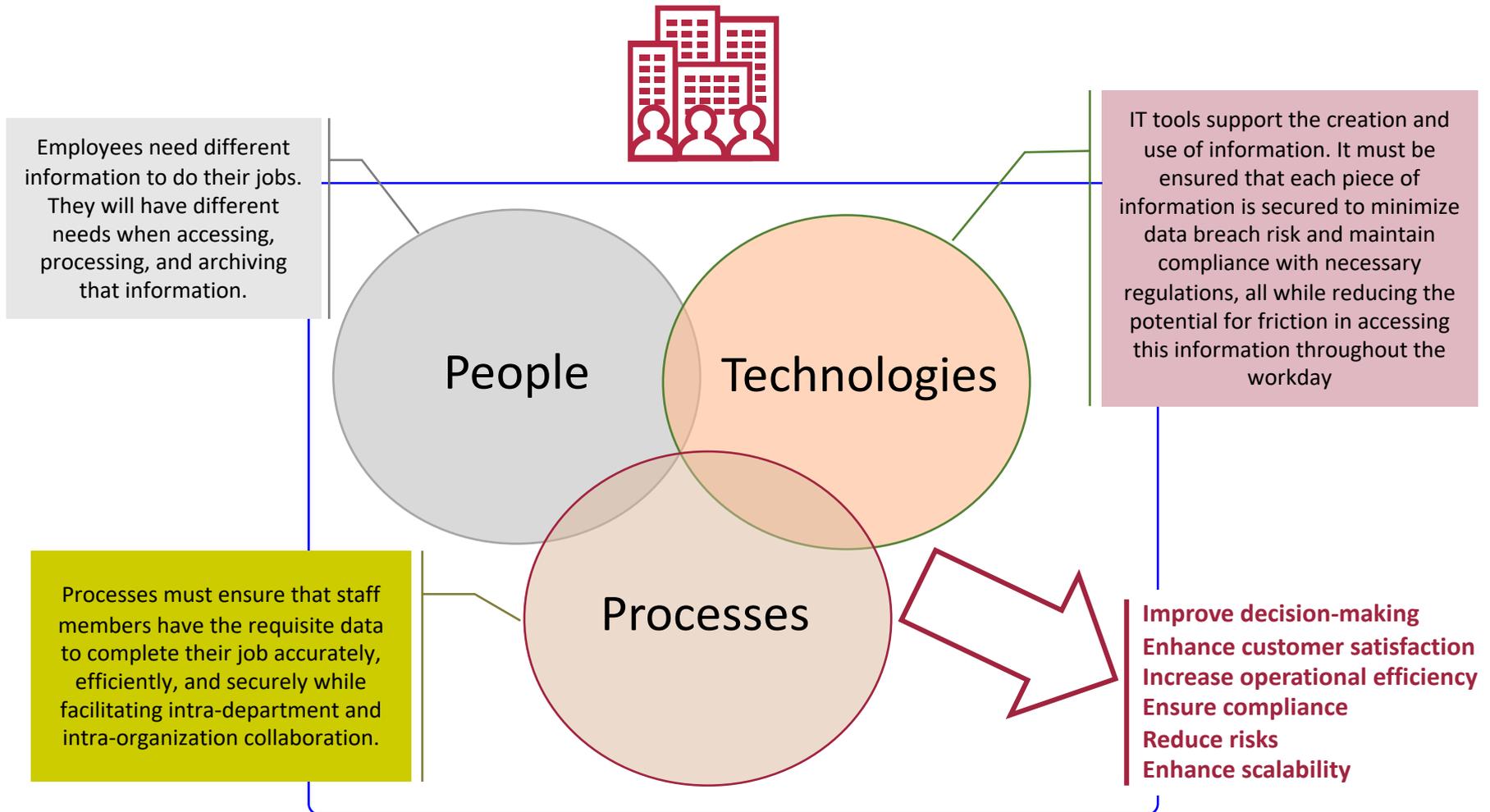
Disability assistance

Weather

Disruptions



IM is the systematic process of collecting, storing, governing, and distributing information to the right people at the right time





The purpose of a system is what it does (POSIWID by Stafford Beer)



Storing data

- > Efficiency
- > No redundancy

Transmitting data

- > Efficiency
- > Security

Processing data

- > Efficiency
- > Availability

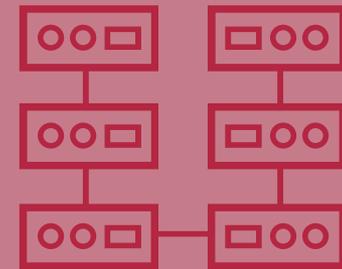
Improving Resilience

- > Compliance
- > Security

Enhancing collaboration

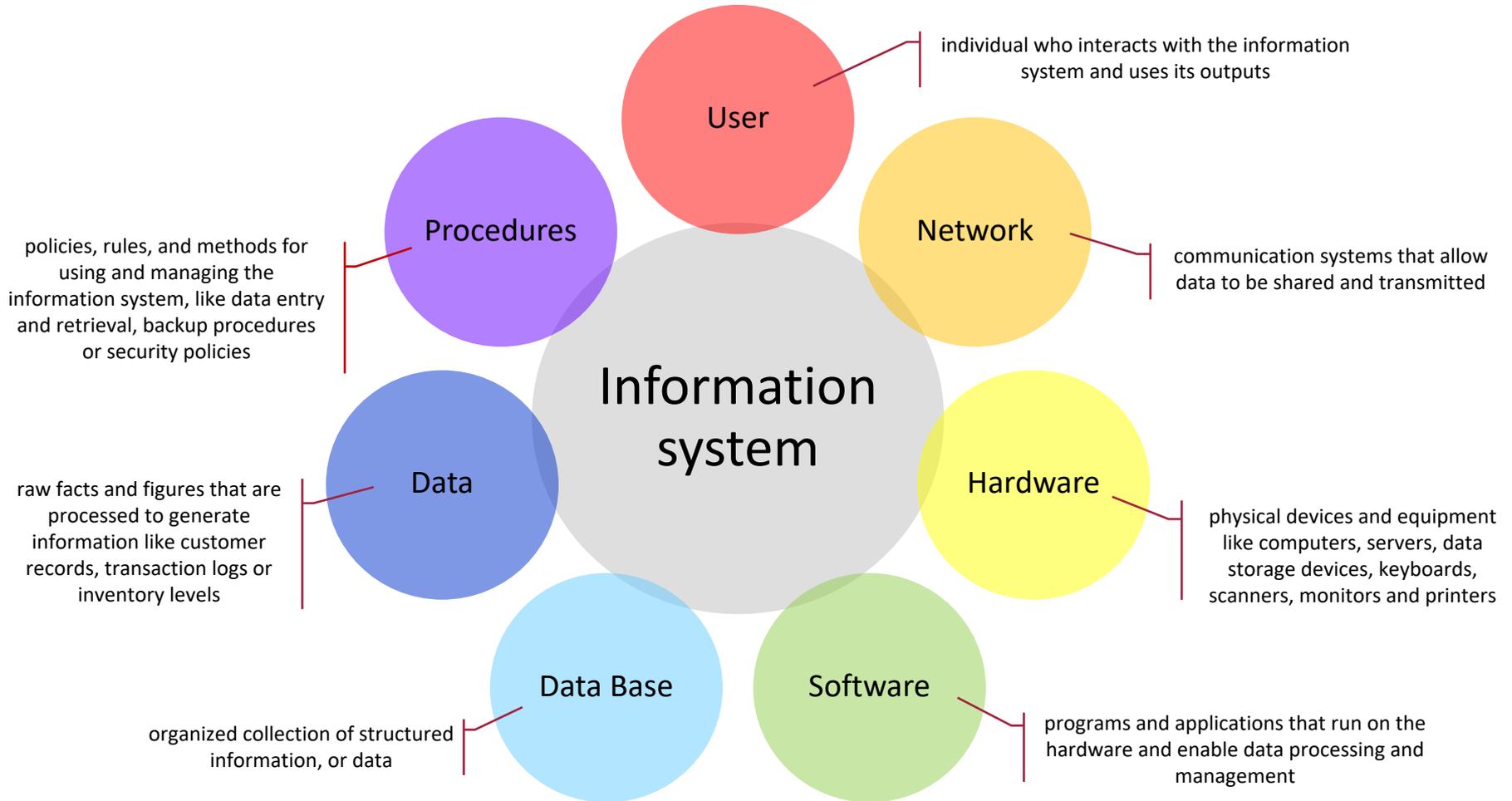
- > Efficiency
- > Customer satisfaction

Information System



Collection, processing, storing,
and distribution of information

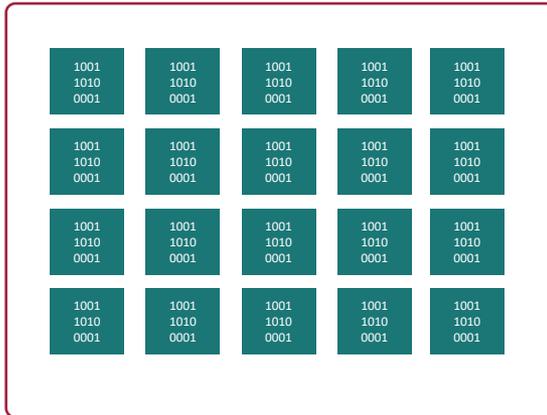
Elements of an Information System





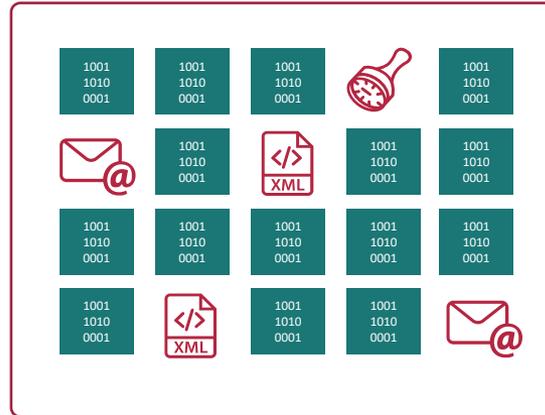
An IS contains potentially all types of data, whether it is structured, semi-structured, or unstructured

Structured Data



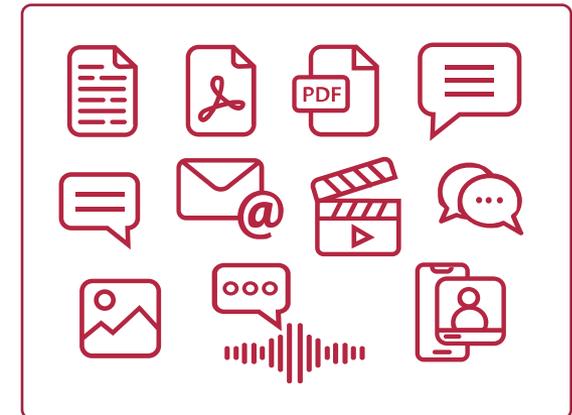
- Customer Relationship Management (CRM)
- Inventory Management
- Transactional Systems
- Business Intelligence and Reporting

Semi-structured Data



- Web Data
- IoT Devices
- Log Analysis
- Email Storage

Unstructured Data



- Social Media and Sentiment Analysis
- Multimedia Analytics
- Customer Support
- Big Data Processing



DBs are used to store, organize, analyze and retrieve data and information, as a structured collection of data, generally stored and accessed electronically from a computer system.

Queries

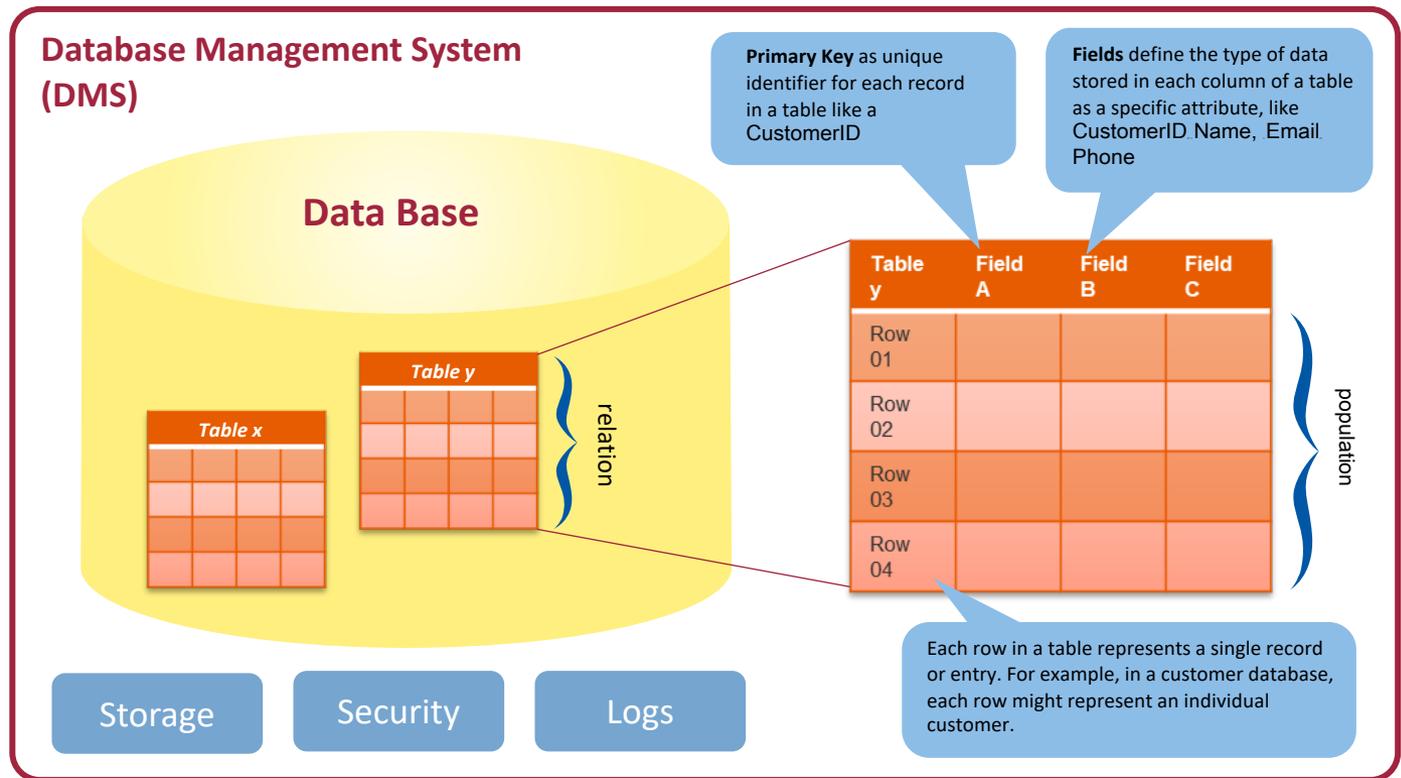
Transactions

API Input

Outcomes

Records

Reports

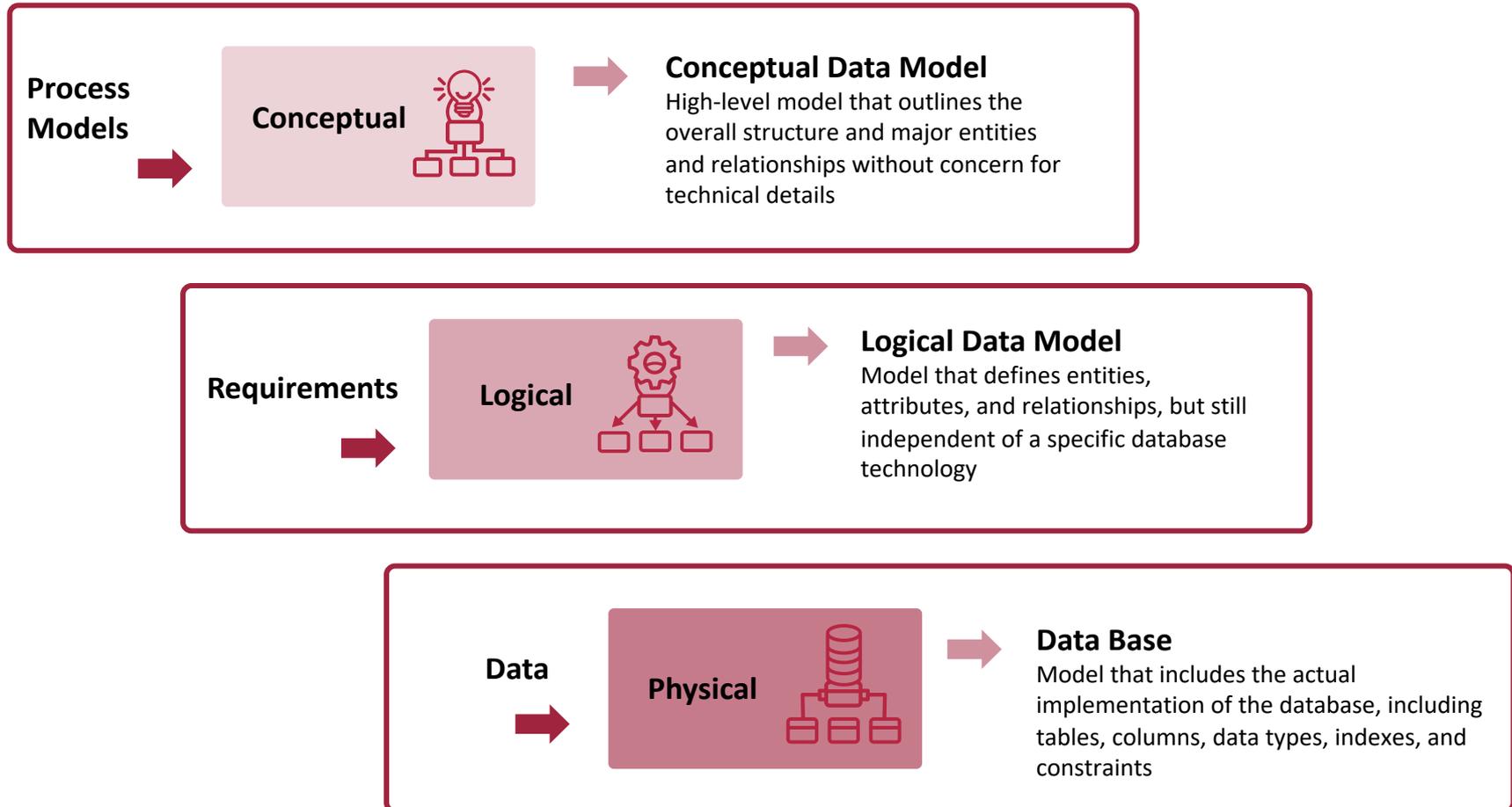




- **Relational Databases** (MySQL, Oracle Database, Microsoft SQL Server, SQLite)
Use Cases: Banking, e-commerce, content management, and transactional systems
- **NoSQL Databases** (MongoDB, Redis, Apache Cassandra, Neo4j)
Use Cases: Real-time analytics, IoT, content personalization, and big data applications
- **Cloud Databases** (Amazon Aurora, Google Cloud Spanner, Azure SQL Database, Snowflake)
Use Cases: Scalability, distributed systems, and reducing infrastructure management
- **In-Memory Databases** (Redis, Memcached)
Use Cases: Caching, real-time analytics, and session management
- **Analytical and Data Warehousing Databases** (Snowflake, Google BigQuery, Amazon Redshift, Apache Hive, Teradata)
Use Cases: Business intelligence, reporting, and big data processing
- **Time-Series Databases** (InfluxDB, TimescaleDB, Prometheus)
Use Cases: Monitoring, IoT, and financial systems
- **NewSQL Databases** (CockroachDB, Google Spanner, TiDB)
Use Cases: Modern applications requiring ACID compliance and scalability
- **Object-oriented Databases** (ObjectDB, db4o)
Use Cases: Engineering applications, simulations, and object-based modeling
- **Graph Databases** (Neo4j, Amazon Neptune)
Use Cases: Social networks, recommendation engines, and fraud detection



Graphical systems used to capture the nature and relationships among data



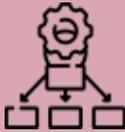


Business understanding > Technical design > Database implementation

Conceptual



Logical



Physical



Entities:

- Book
- Author
- Member

Relationships:

- A Book is written by one or more Authors.
- A Member borrows zero or more Books.

```
Book (BookID [PK], Title, ISBN, PublishedDate)
Author (AuthorID [PK], Name, BirthDate)
Member (MemberID [PK], Name, Email, JoinDate)
```

```
BookAuthor (BookID [FK], AuthorID [FK]) ← Junction table for many-to-many
Borrow (BorrowID [PK], BookID [FK], MemberID [FK], BorrowDate, DueDate)
```

```
CREATE TABLE Book (
  BookID INT PRIMARY KEY AUTO_INCREMENT,
  Title VARCHAR(100) NOT NULL,
  ISBN VARCHAR(13) UNIQUE,
  PublishedDate DATE
);

CREATE TABLE Author (
  AuthorID INT PRIMARY KEY AUTO_INCREMENT,
  Name VARCHAR(50) NOT NULL,
  BirthDate DATE
);
```

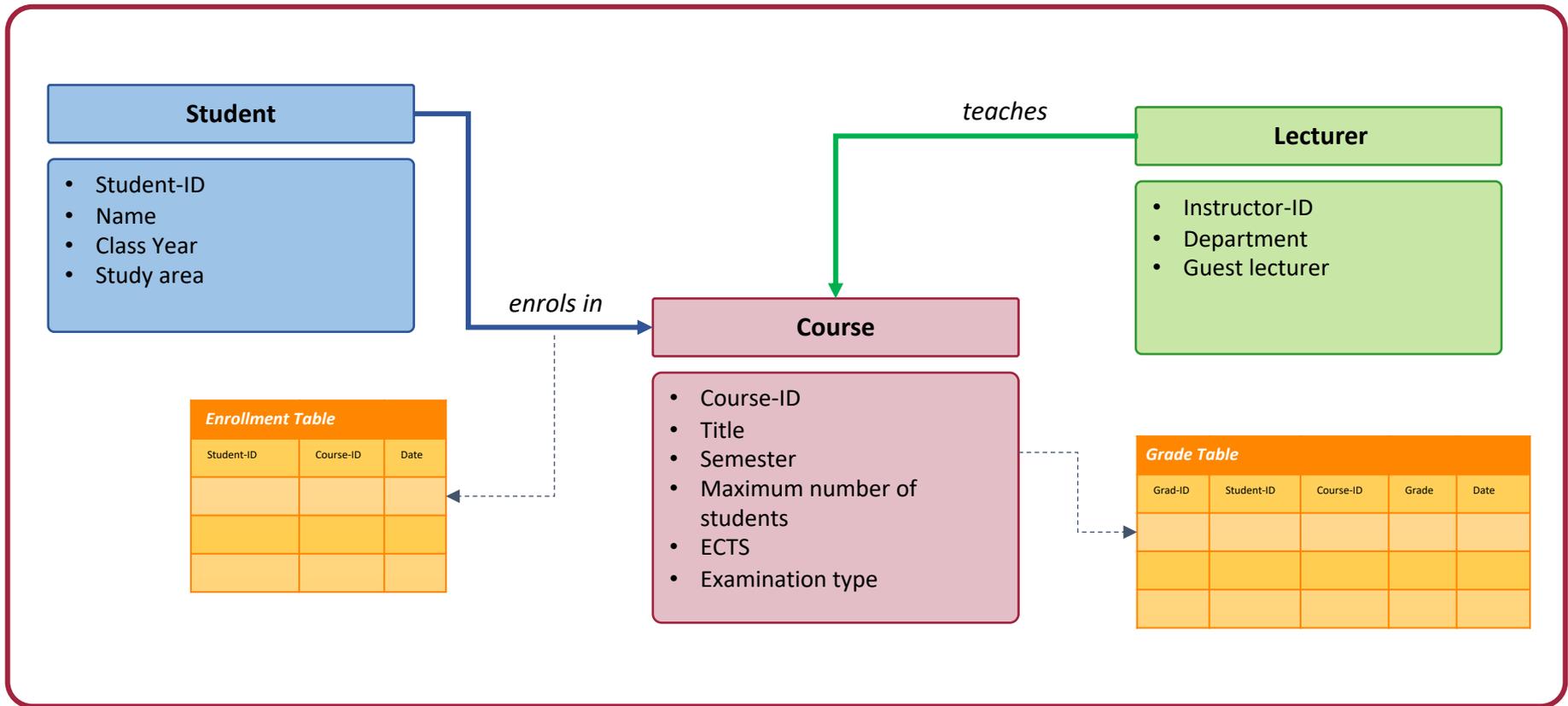
```
-- Junction table for Book-Author (many-to-many)
CREATE TABLE BookAuthor (
  BookID INT REFERENCES Book(BookID),
  AuthorID INT REFERENCES Author(AuthorID),
  PRIMARY KEY (BookID, AuthorID)
);

-- Borrow transaction table
CREATE TABLE Borrow (
  BorrowID INT PRIMARY KEY AUTO_INCREMENT,
  BookID INT REFERENCES Book(BookID),
  MemberID INT REFERENCES Member(MemberID),
  BorrowDate DATE NOT NULL,
  DueDate DATE NOT NULL,
  INDEX (BookID, MemberID) ← Added for query performance
);
```

Entity Relationship Diagram (ERD)



An ERD illustrates how “entities” such as people, objects or concepts relate to each other within a system

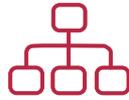




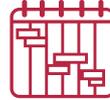
Relationships between tables are done via foreign keys which refer to the primary key of another table. This establishes a link between the two tables and enforces referential integrity. One-to-One, One-to-Many, and Many-to-Many are the primary types of relationships in a relational database.



Employee



Department

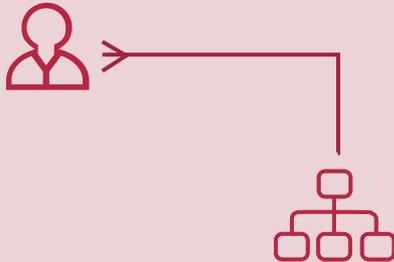


Project



Project Leader

Many-to-One



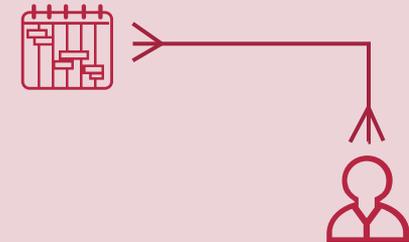
One department can have many employees, but each employee belongs to only one department

One-to-Many



A single project leader can manage multiple projects simultaneously, but just one person is responsible for a project, the project leader

Many-to-Many



Employees can work on multiple projects and each project can have multiple employees



Customer - Order - Article - Order Item



One-to-Many Relationship

A **customer** can place **many orders**. Each order is associated with exactly one customer.

Customer Table			
customer_id	customer_name	email	phone_number
C01	John Smith	js@example.com	123-456-7890
C02	Lara Croft	lc@example.com	987-654-3210
C03	...	...	...

Order Table			
order_id (PK)	customer_id (FK)	order_date	total_amount
O_01	C01	2024-12-13	2000.00
O_02	C02	2024-12-14	75.00
O_03	C03	...	...

Legend:

PK: Primary Key
FK: Foreign Key



Article Table

Artikel_id (PK)	Article_name	price	stock_quantity
A_01	Laptop	1000.00	20
A_02	Smart-phone	500.00	65
A_03	...	...	...

Many-to-One Relationship

An **order item** refers to one **article**. Each article can appear in many order items.

One-to-Many Relationship

An **order** can contain **many order items**. Each order item is associated with exactly one order.

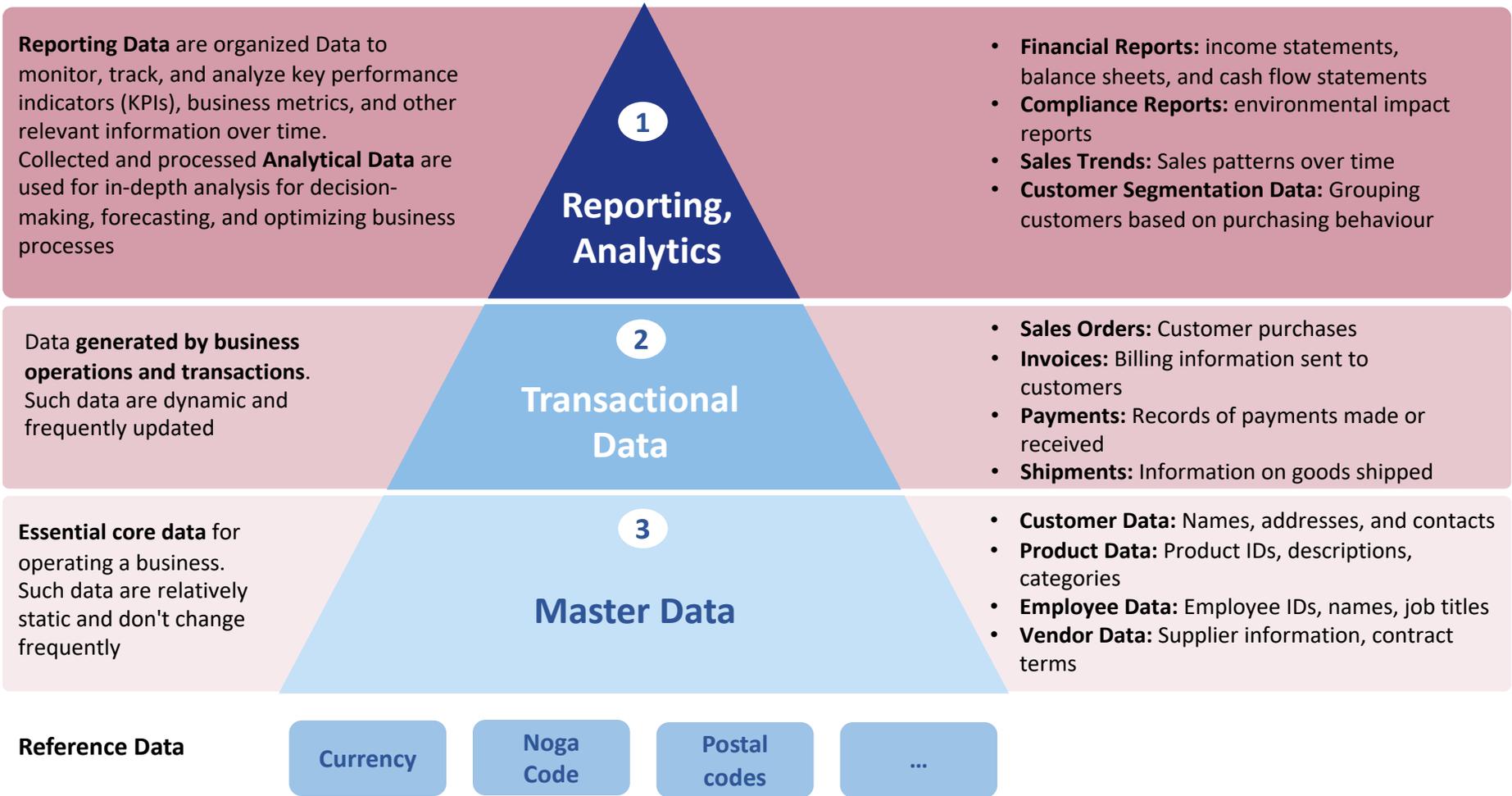


Order Item Table

order_item_id (PK)	order_id (FK)	article_id (FK)	quantity	item_total
PO_01	O_01	A_01	1	1000.00
PO_02	O_01	A_02	2	1000.00
PO_03	O_02	...	...	...

In summary:

- **Customer table:** Stores customer details.
- **Order table:** Stores orders placed by customers.
- **Article table:** Stores details of products available for purchase.
- **Order Item table:** Links orders to articles, specifying which articles were bought and in what quantity.





Essential core data about key business entities that provides context for business transactions and operations

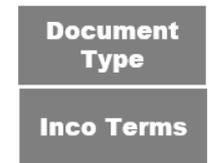
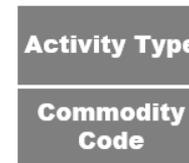
SAP Master Data Governance:

A single application for enterprise master data management

Out-of-the-box, domain-specific solutions delivered by SAP



Domains implemented by customers using SAP MDG's extensible application framework





Basic federal register

- Company name
- Unique Identification Number (UID)
- Type of Entity
- Registered office or domicile
- Address of the company
- Date of Incorporation
- Purpose
- Statutory Capital
- Share Structure
- Directors
- Authorized Signatories
- Auditors
- Status Active or Inactive
- Registration Details
- Branches
- Mergers, Acquisitions, and Liquidations

Thematic federal registers and federal information systems

- Business sectors (classified by NOGA codes)
- Employment statistics
- Registered trademarks, patents, and designs
- Company name protections and exclusivity
- Bids submitted for public procurement
- Status of insolvency proceedings
- Liquidators assigned to the case
- Permits for activities affecting the environment
- Compliance reports and violations
- Grants and subsidies received by businesses
- Purpose and outcomes of the financial aid

Cross-divisional information systems of the federal government

- Operational Licenses
- Export/Import Authorizations
- Regulatory Compliance Status
- Audit Results or Notices
- Sanctions and Restrictions
- Revenue/Turnover Bands
- Number of Employees
- Sector-Specific Indicators
- Foreign Affiliations
- Cross-Border Trade Data

Other federal or cantonal databases

- VAT (Value-Added Tax) Data
- real estate ownership and local levies
- Registration data for companies hiring foreign workers
- Local records of employees and businesses
- Company credit profiles, overdue payments, and liabilities relevant to financial transactions
- Licensing agreements and IP-related disputes
- Licensing and registration for companies operating transport services
- Pollution and Emission Registers
- Registries for farming cooperatives, subsidies, and land use data
- Data on companies generating, distributing, or trading energy



Information recorded from transactions, as a transfer of goods, services, money, data, or information between two or more parties





Collection, organization, and presentation of information or statistics related to a specific topic or event



Question: Which Data for which Type?



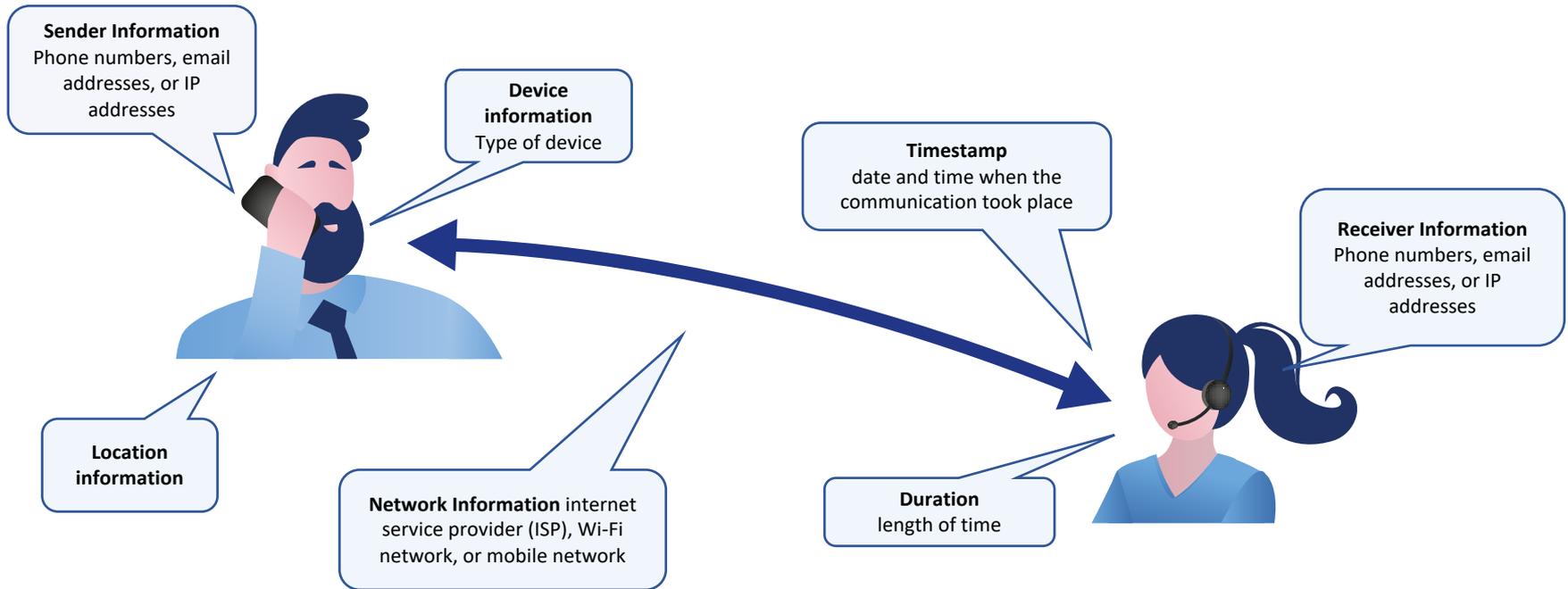
- Monthly sales numbers for each product category
- Sales order numbers
- Items purchased
- Energy consumption levels
- Supplier contact details
- Payment terms
- Website traffic
- Trades executed on stock exchanges
- Project progress
- Physical locations of stores
- Company vehicles
- Online purchase
- Patient visits
- Equipment maintenance schedules
- Call records
- Compliance with safety regulations
- Training completion rates

- Master Data
- Transactional Data
- Reporting Data



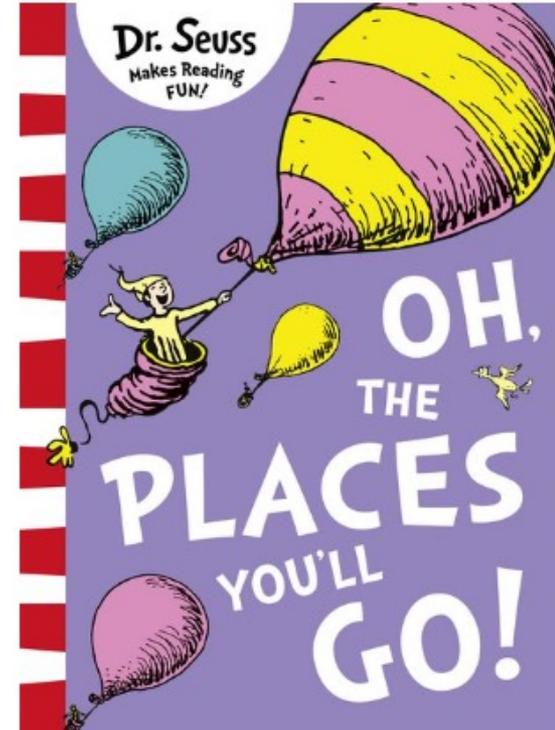
It provides information about other data, helping to understand, manage, and use it effectively

Communication metadata include various details about a communication event, such as who was involved, when it occurred, and how it was transmitted and do not provide information about the actual content of the communication itself.





**Today you are You,
that is truer than true.
There is no one alive
who is Youer than You.**
-Dr. Seuss





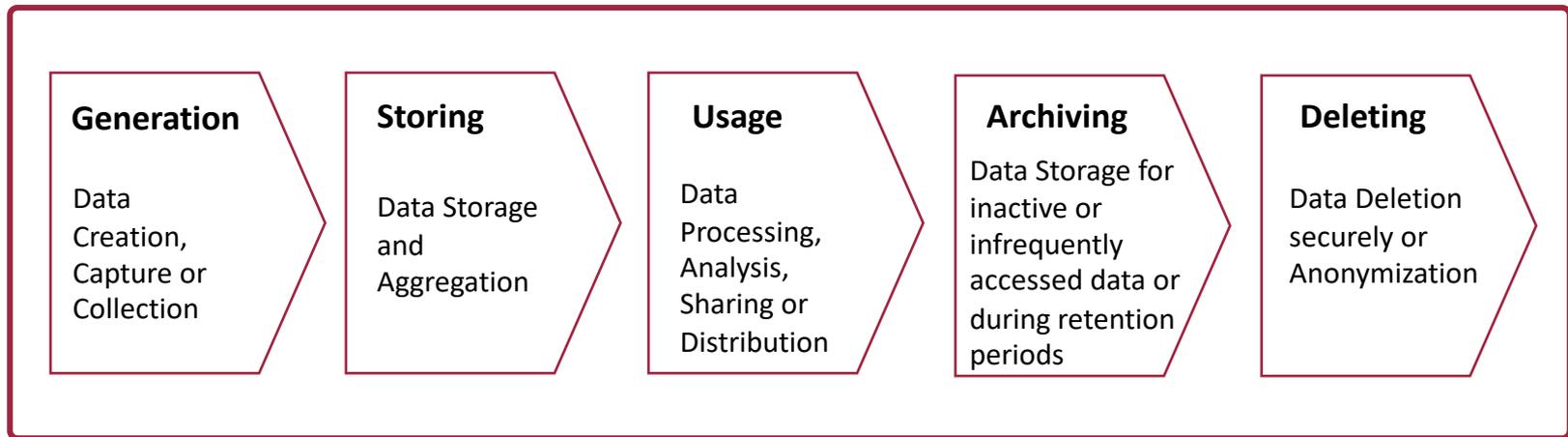
Data are changing over time





Process of collecting, managing, storing, analyzing, and archiving data to keep them accurate and up-to-date

Compliance Requirements (Data Protection Act...)



Events and Triggers

(moving, turning 18-year-old, marital status, changing name...)

Examples of Data Lifecycle





Data are vital for organizations to drive efficiency, innovation, and progress



Economic Value

- Improving products and services
- Cost savings
- Selling data

Strategic Importance

- Strategic decision-making
- Insights into market trends, customer behaviour
- Competitiveness

Legal and Ethical Considerations

- Proper use of data
- Complying with data privacy regulations



By leveraging data, companies can improve their performance, reduce costs, increase customer satisfaction, and assure compliancy.

Your Data is an Asset

COLLECT IT

STORE IT

USE IT

SELL IT



Creating value with data



Business Improvements

Make existing business more efficient

- Customer orientation and personalization
- Efficiency increase (Process or Planning optimization)
- Risk reduction
- Assurance of being compliant



Selling Data as a Product

Sharing, selling, or licensing data to third parties for revenue

- Raw data
- Processed data
- Data-as-a-Service
- Insights or analytics
- Data aggregator
- Enriched data with metadata, machine learning models, or integrating demographic, geographic, or behavioral attributes



New Business Models

Create new business models

- New products or services
- Redefinition of the value chain
- Develop platforms or new data-enabled markets
- Leverage Innovation and Technology



A step-by-step approach



Step 1: Preparation

- Understand the value of data as an asset
- Identify potential use cases
- Clarify the value the company data can offer to stakeholders
- Evaluate the available data, its quality, and relevance
- Ensure data usage adheres to privacy laws and industry standards
- Establish technical capabilities such as cloud storage, data integration platforms, and analytics tools



Step 2: Piloting

- Choose specific scenarios or business functions
- Build pilot solutions
- Validate data models and insights with initial datasets
- Deploy the pilot in controlled environments
- Gather feedback from stakeholders and refine models
- Assess key metrics and identify scalability potential



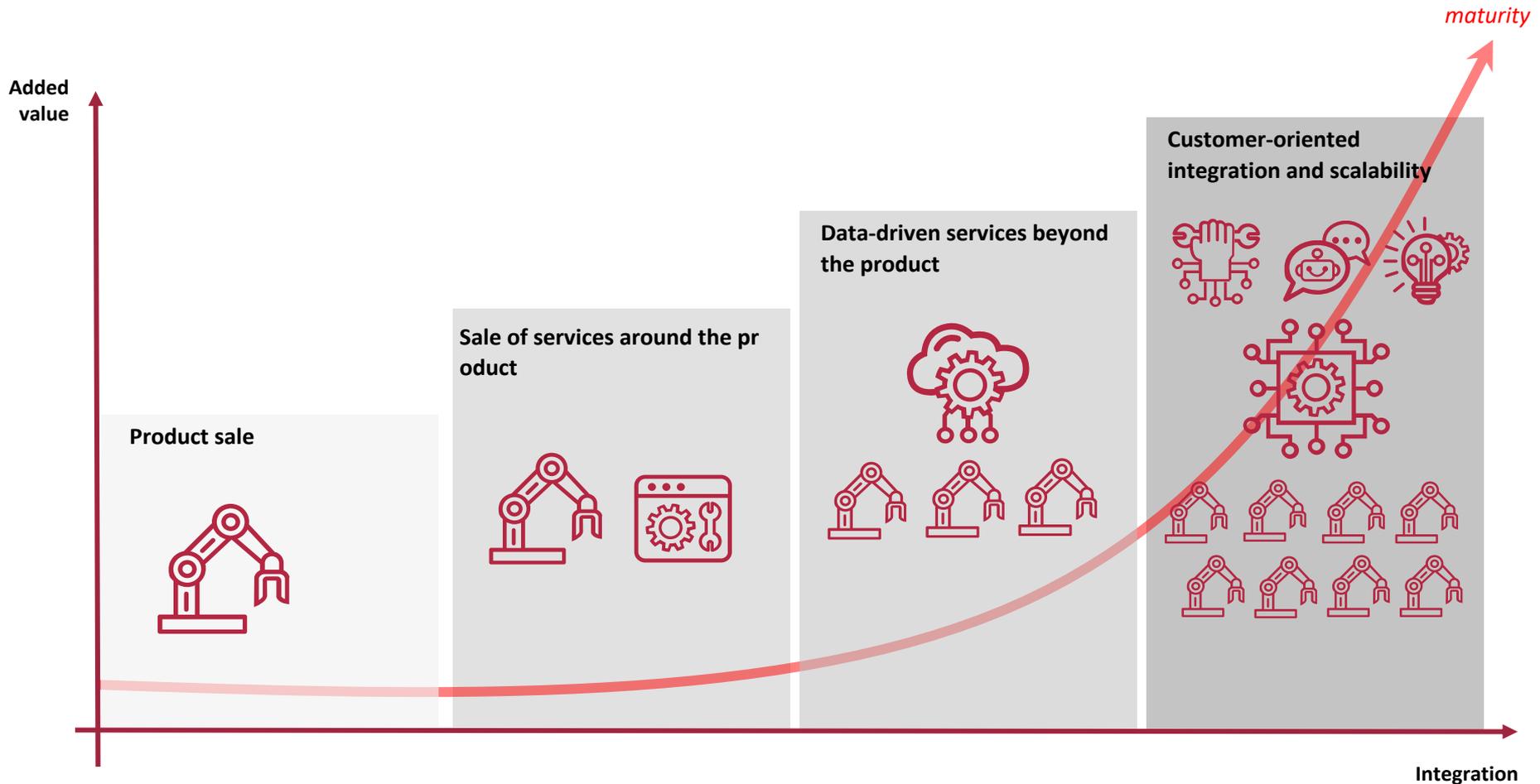
Step 3: Commercialization and Deployment

- Develop pricing models and packages
- Expand infrastructure to handle larger data volumes
- Automate and optimize processes for scalability
- Develop marketing and sales strategies
- Engage target customers through channels
- Gather ongoing feedback to enhance product offerings
- Explore new use cases, partnerships, or innovations



Transformational process whereby a company shifts from a product-centric to a service-centric business model

Servitization is the lamp and data monetization is the electricity





Hilti as Example

Added value

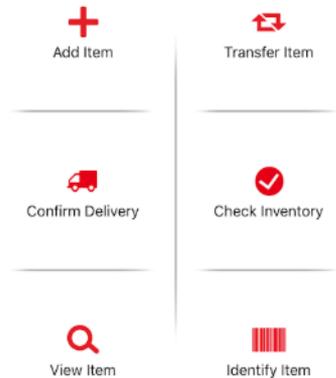
Fleet management: Complete solution providing devices combined with a full-service package - from free repairs to anti-theft protection



On!Track: Digital management of devices in terms of frequency of use, device status and other important tool information



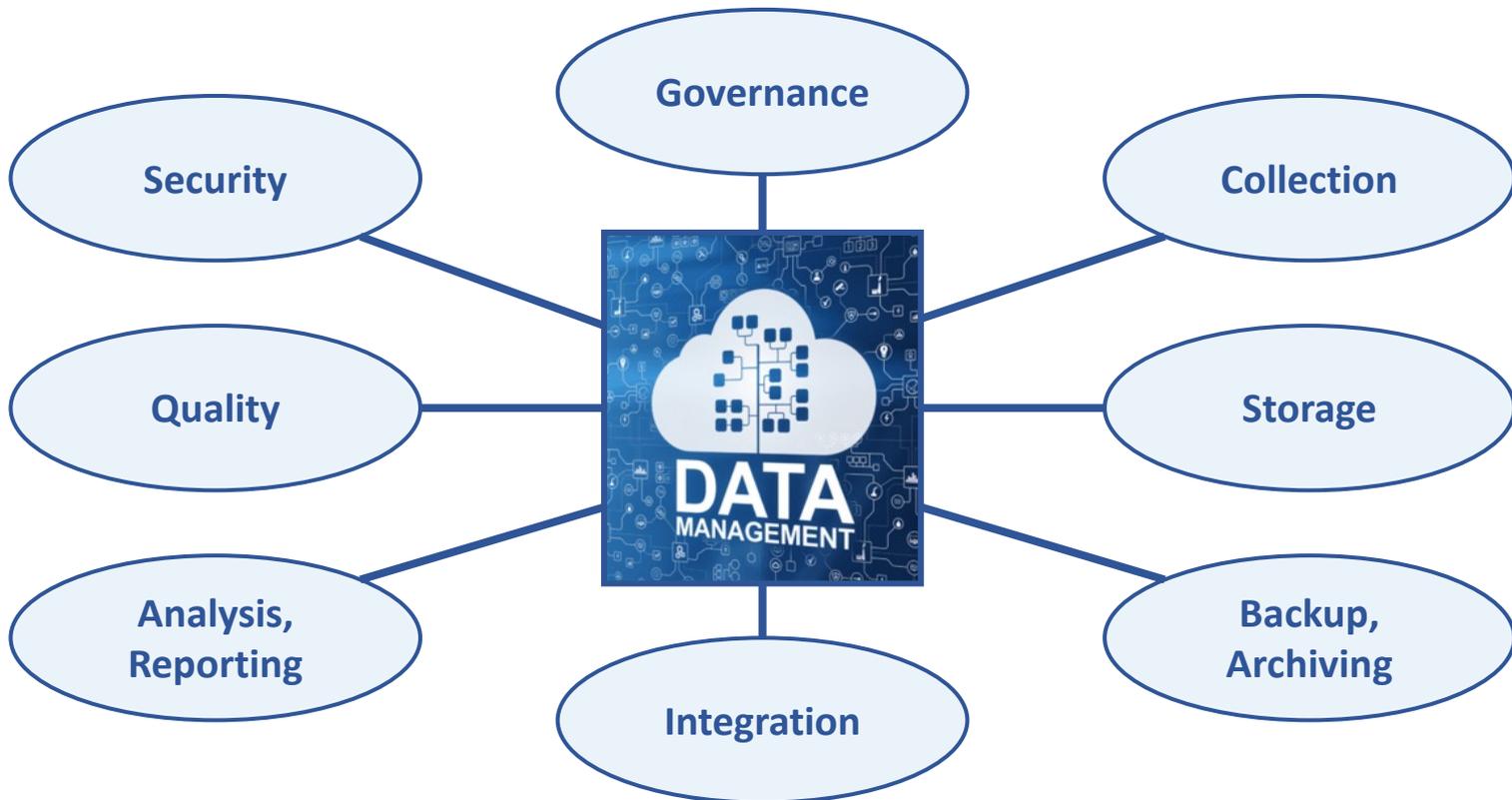
Nuron: new battery platform with integrated connectivity



Integration

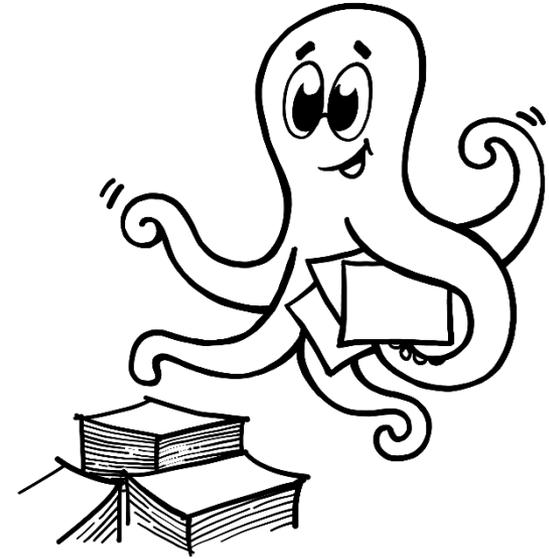


Data Management is essential for improving efficiency, ensuring data accuracy and integrity, complying with regulations, protecting sensitive information, making informed decisions, enabling growth and scalability, and ensuring business continuity





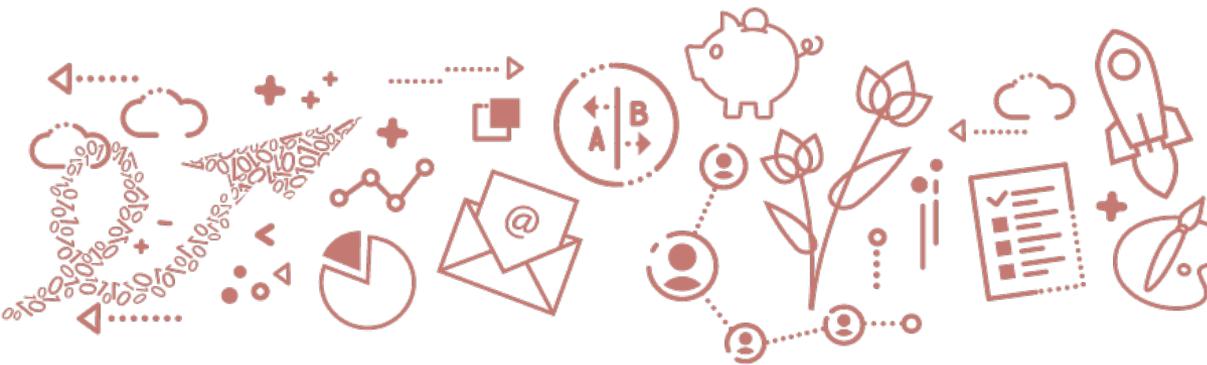
- Difference between Information and Data
- Components of Information Systems
- Three Data Types
- Definition of Meta Data
- Data Lifecycle
- Relevance of Data Management





- Bonnet P. (2010) Enterprise Data Governance. John Wiley & Sons, Inc., Hoboken, New Jersey
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KNOWLEDGE