

Data Management Fundamentals

SESSION 1- OVERVIEW AND INTRO

AGENDA

- Facilitator Introduction
- Introductory Note
- Introducing the CDMP
- Certification Levels
- CDMP Badges
- Reading Materials
- Exams
- Exam Platform
- Preparing for the exam
- Expectations
- Q & A
- Next Session

INTRODUCTORY NOTE

- It is not an official, DAMA International authorized training course because DAMA-I has not yet created an authorized trainer program.
- The purpose of this training is to help prepare professionals to take the CDMP. We will do so by reviewing the content of chapters of the DMBOK2. If you are not interested in certification then you will gain valuable data insights!
- The chapter makes no claims for the effectiveness of the sessions or the ability of participants to pass the CDMP exam after having attended. In fact, you should plan on doing a lot of individual study to pass the exam if that is what you plan to do.

INTRODUCING THE CDMP

What is the CDMP?

- The Certified Data Management Professional certification is the official certification of DAMA International.
- DAMA owns the IP and trademark

Value of the CDMP

- Professional Development Milestones
- Continuous Professional Growth
- International Recognized Measurement of Accomplishment
- Greater credibility and recognition in the marketplace
- May be a requirement in some areas

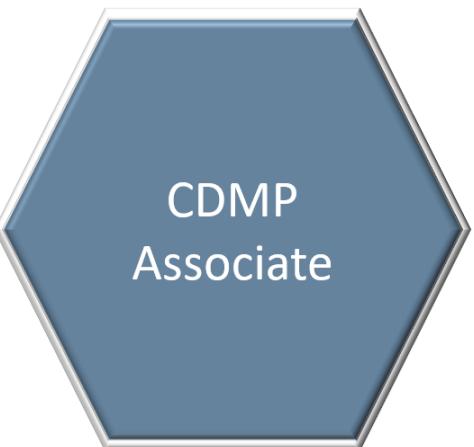
Resources

- [CDMP.info](#)
- DAMA DMBok 2
- Navigating the Labyrinth
- Practice Exams
- DAMA New England

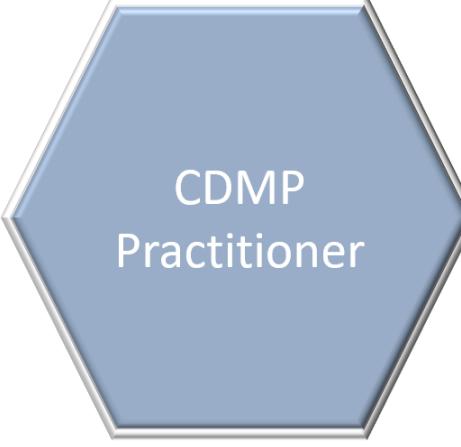
How do I take exams?

- Online (*\$300 + \$11 online proctor fee*)
 - At your own time and own space
 - Available 24/7
 - Proctored using Honorlock
- DAMA Partner Conferences (*Pay-if-Pass*)
 - Conferences such as EDW, etc.
- DAMA Chapter Event (*Pay-if-Pass*)
 - DAMA New England will host an exam in the fall 2020

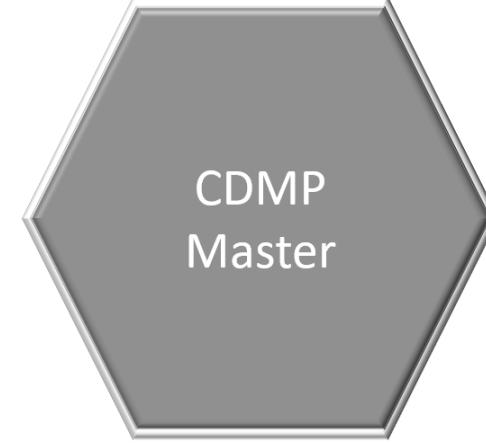
CERTIFICATION LEVELS



CDMP
Associate



CDMP
Practitioner



CDMP
Master



CDMP
Fellow

Central Membership

6 mo > 5 Years experience

60% pass

Data Management
Fundamentals Exam

Central Membership

2-10 Years experience

70% pass

Data Management
Fundamentals Exam

Plus 2 specialty exams
1 substitute allowed

Central Membership

Min 10 Years experience

80% pass

Data Management
Fundamentals Exam

Plus 2 specialty exams
1 substitute allowed

Central Membership

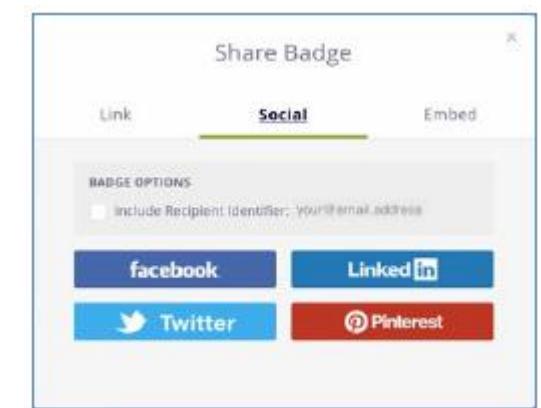
Min 25 Years experience

CDMP Master
Contribution to DMBoK &
CDMP
Demonstrated thought
leadership and contributions
to profession

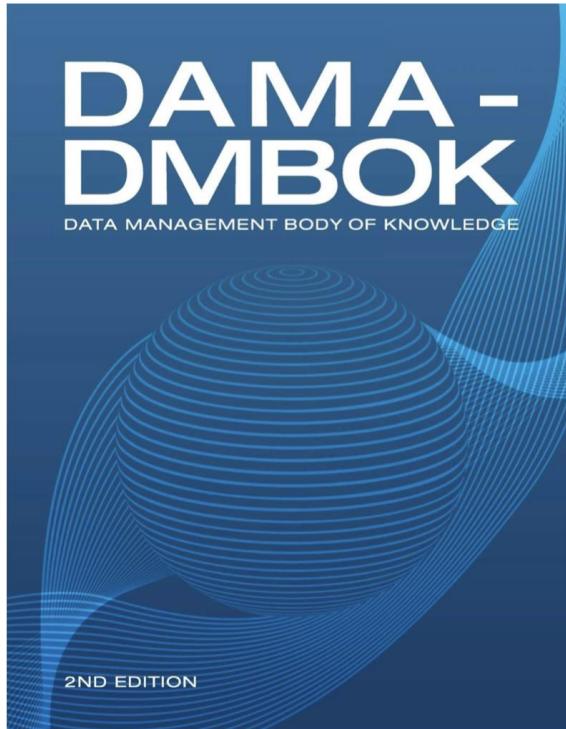
By nomination only

CDMP BADGES

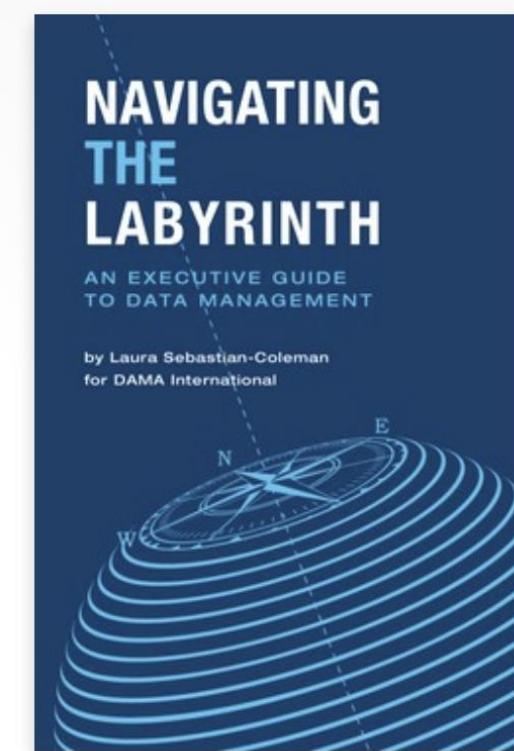
- Exam platform awards badges for passing CDMP certifications.
- You can put these badges on your CV, LinkedIn, Twitter, Facebook or even Pinterest.
- Badges are not just an image.
- Badges carry metadata that can be verified.
- Badges are part the global movement called the “OpenBadges” specification.
- Part of the open badges specification & community are public verification authorities that you can use to independently verify your badges are authentic.
- *For more information please visit CDMP.info*



READING MATERIALS



Required



Suggested

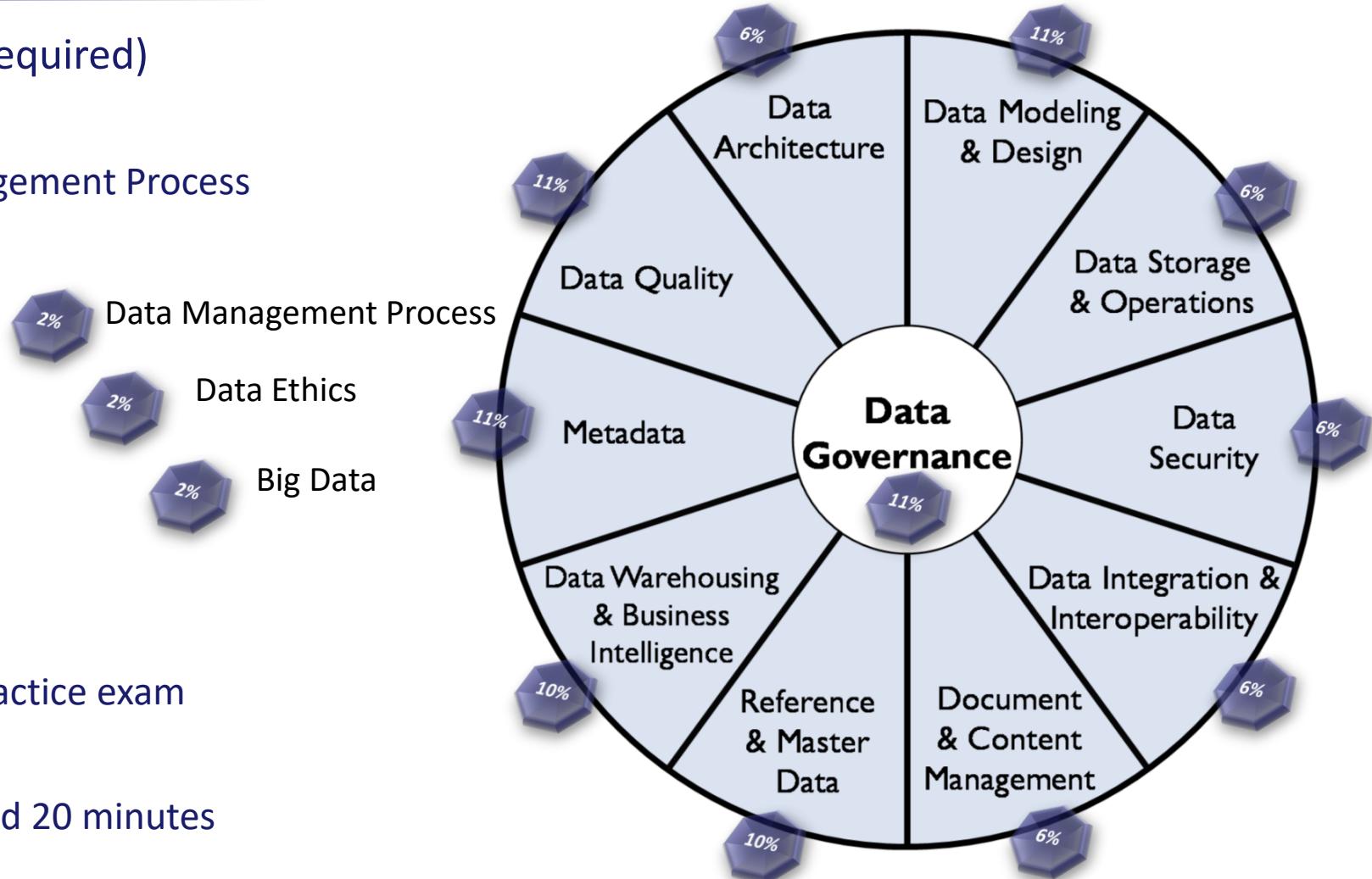
Available from:

-  TECHNICS PUBLICATIONS
TECHNOLOGY / LEADERSHIP
-  O'REILLY®
Safari
-  **amazon**

Note: each DAMA-DMBOK chapter has a “Work Cited/Recommended” reading page at the end of the chapter

EXAMS

- Data Management Fundamentals (required)
 - 11 knowledge areas
 - Plus Ethics, Big Data, & Data Management Process
- Specialist Exams
 - Data Governance
 - Data Quality
 - Data Modeling and Design
 - Metadata
- Exams
 - 100 multiple choice questions
 - All Exams include a 40 Question practice exam
 - 90 minutes to complete the exam
 - If English is not a main language add 20 minutes



* Additional exams are currently under development

EXAM PLATFORM

Question 3

Which of these are NOT true of Data Governance??

- DG is a continuous process of data improvement
- A DG initiative should always be led by the IT department
- IT is a key stakeholder in DG
- There are different organization models for DG
- DG is the exercise of authority and control over the management of data assets

Flag a question to come back to
But Always give an answer **NOW.**

Question 5

1 pts

Which of these does NOT characterize an effective data steward?

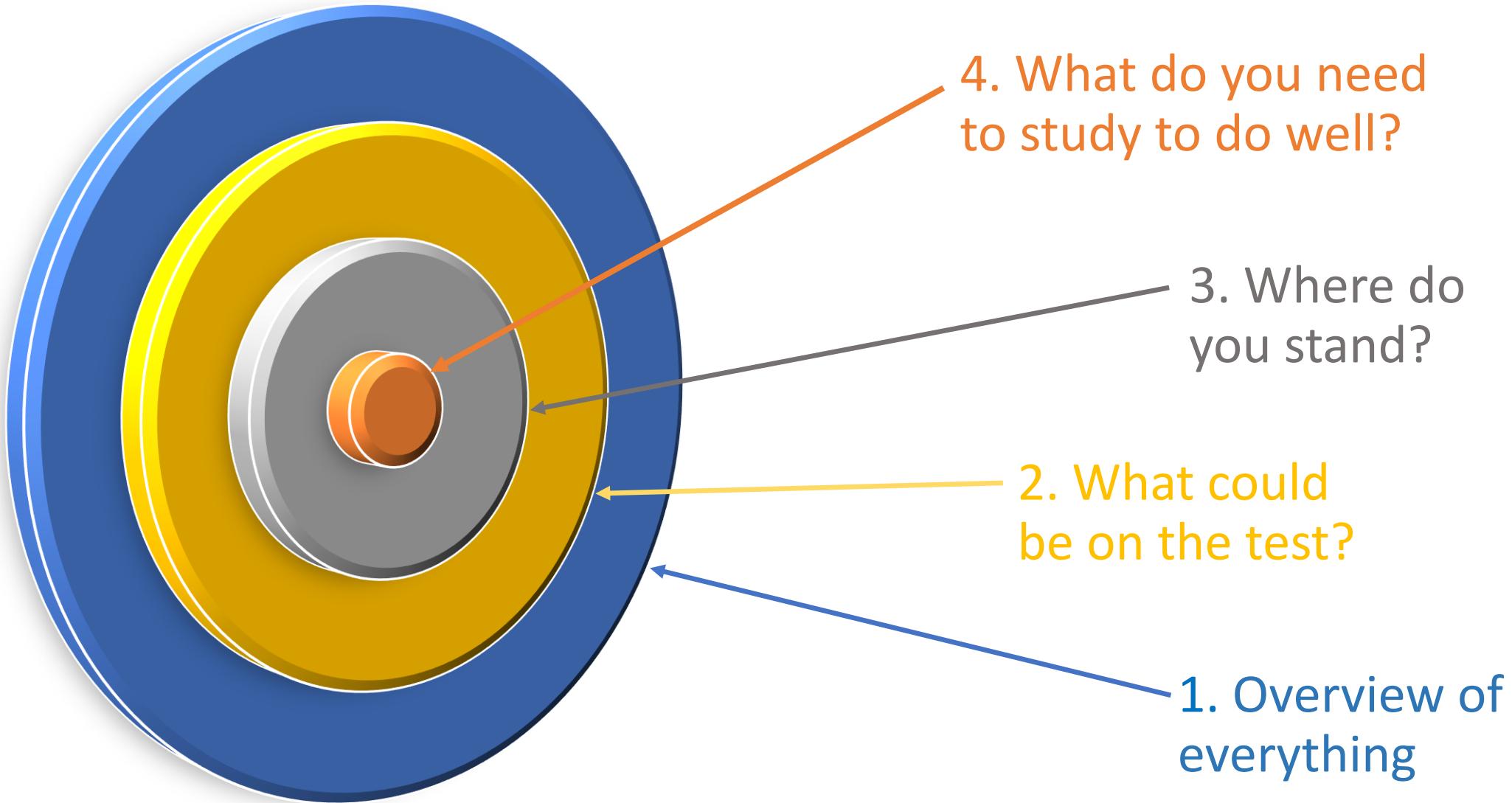
- Is a recognized subject matter expert in the data subject area / business domain that he or she is responsible for
- Is a highly experienced technical expert in a variety of data management disciplines & tools
- He / She works in association with the Data Owner to protect and enhance the data assets under his or her control
- He / she works collaboratively across the organization with data stakeholders and others Identifying data problems & issues
- He / She is an effective communicator

Question 4

What are the primary responsibilities of a data steward?

- Identifying data problems & issues
- The manager responsible for writing policies and standards that define the data management program for an organization.
- Analyzing data quality
- A business role appointed to take responsibility for the quality and use of their organization's data assets.
- The data analyst who is the subject matter expert (SME) on a set of reference data.

PREPARING FOR THE EXAM



STUDY GROUP EXPECTATIONS

Expectations of study group participants are to:

- ✓ Read and study the DMBOK chapter prior to the scheduled study group session
- ✓ Join the scheduled study group sessions promptly
- ✓ Get the most out of each study group sessions by actively listening & participating

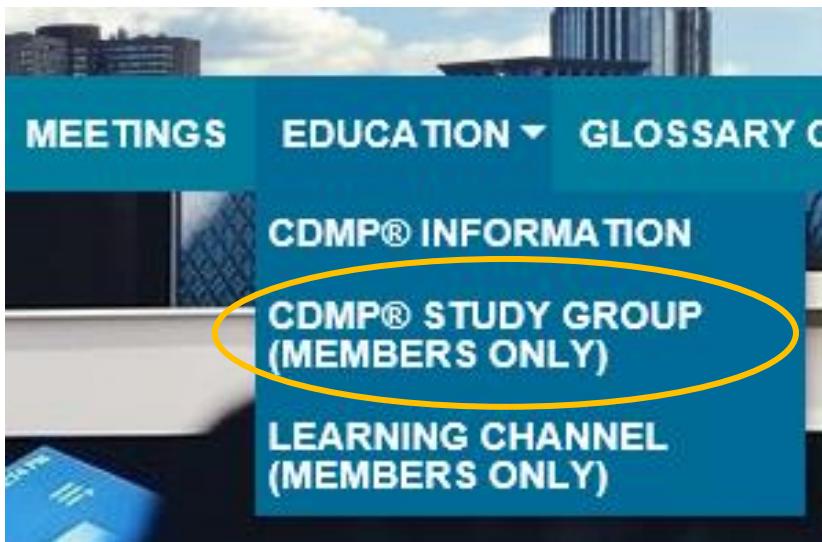
We **encourage** all study group participants to:

- ✓ Send ideas to the facilitators on study group materials, format, and more
- ✓ Volunteer to facilitate a study group session
- ✓ Encourage friends and colleagues to join the study groups



STUDY GROUP MATERIALS

Study group presentations will be posted on [CDMP Study Group page](#), on [DAMA New England website](#), in the Schedule & Agenda section.



Schedule & Agenda

Training Study-Groups will be held every other Wednesday at 7pm, per the following Schedule and Agenda

| Session | Date | Topic | Facilitator | Link to Materials |
|---------|---------------|----------------------------|-----------------|-------------------|
| 1 | February 5th | Overview & Introduction | Agnes Vega | |
| 2 | February 19th | Chapter 1: Data Management | Tony Mazzarella | |

Q & A



NEXT SESSION



| Topic |
|--|
| Chapter 1: Data Management |
| Chapter 2: Data Handling Ethics |
| Chapter 3: Data Governance |
| Chapter 4: Data Architecture |
| Chapter 5: Data Modeling & Design |
| Chapter 6: Data Storage & Operations |
| Chapter 7: Data Security |
| Chapter 8: Data Integration & Interoperability |
| Chapter 9: Document & Content Management |
| Chapter 10: Reference & Master Data |
| Chapter 11: Data Warehousing & Business Intelligence |
| Chapter 12: Metadata Management |
| Chapter 13: Data Quality |
| Chapter 14: Big Data & Data Science |
| Chapter 15: Data Management Maturity Assessment |
| Chapter 16: Data Management Organization & Role Expectations |
| Chapter 17: Data Management & Organizational Change Management |
| Final Review |

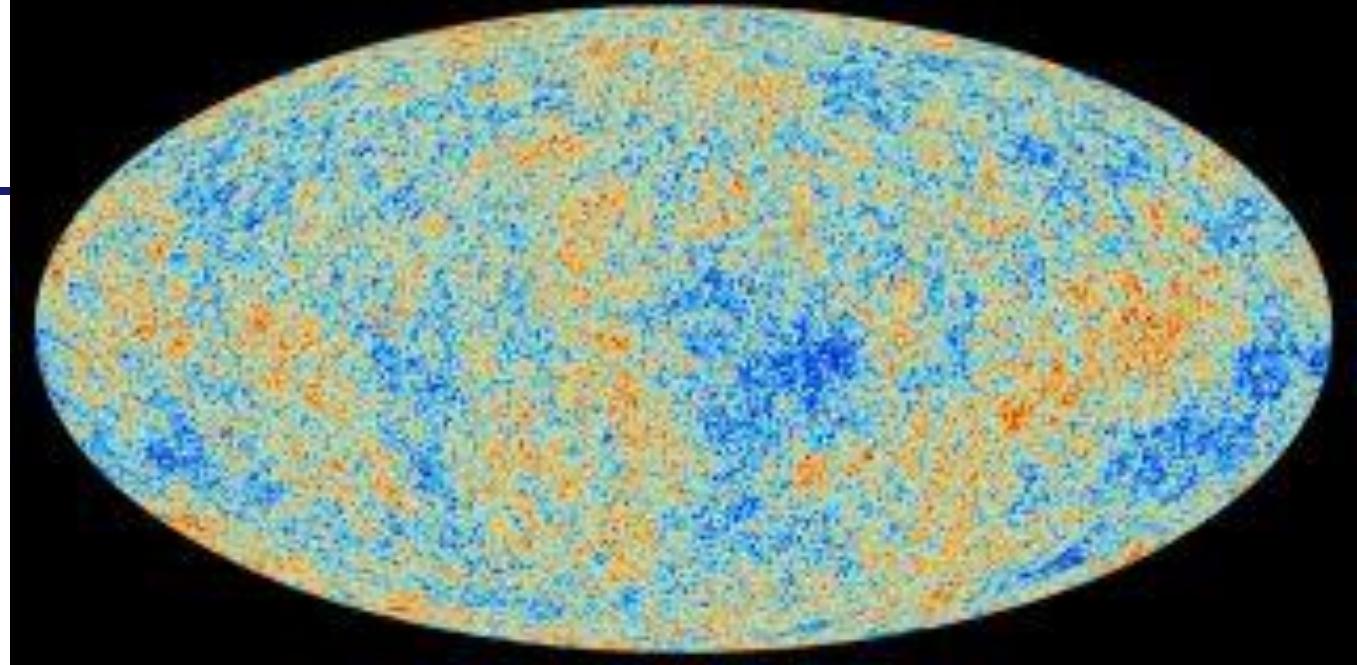
HOMEWORK

What is the one thing you have learned by reading chapter 1 on
“Data Management” that you did not know before?

Part 1: Data Management

AGENDA

- Facilitator Introduction
- Introductory Note
- Chapter 1: Data Management
 - What is Data?
 - Why we need data management?
 - Data and Information
 - Data as an Asset
 - Data Management Principles
 - Data Management Challenges
 - Data Management Strategy
 - Data Management Frameworks
 - DAMA and the DMBOK
- Q & A
- Next Session



Note:

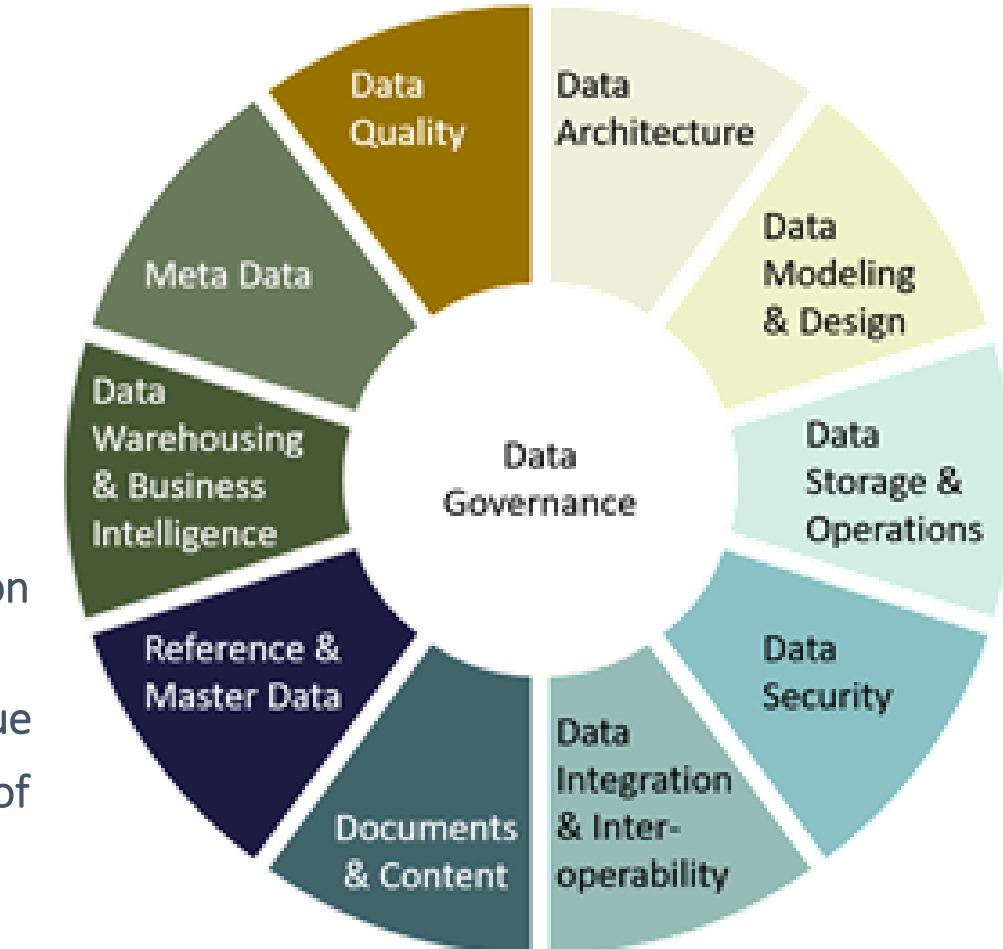
- Chapter 1 Lays the foundation for the DMBOK2.
- Material from the other chapters can/should be understood in relation to the challenges of data management

Chapter 1: Data Management

Data Management is the development, execution, and supervision of plans, policies, programs, and practices that deliver, control, protect, and enhance the value of data and information assets throughout their lifecycle. (DMBOK2)

There is a lot here:

- Development, execution, and supervision
 - Plans, policies, programs, and practices
 - Deliver, control, protect, and enhance
 - The value of data and information assets
 - Throughout their lifecycle
- Activities
 - Focused on objects
 - To manage and improve the condition of data
 - In order to bring value
 - Across the life cycle of data



Chapter 1: Data Management

Business Drivers:

- Competitive advantage – better data = better decisions
- Failure to manage data results in waste and lost opportunity
- Data as an asset – Primary driver of data management is to enable organizations to get value from their data assets – just as they manage financial and physical assets and people to generate value.

Goals:

- Understanding and supporting the **information needs of the enterprise** and its stakeholders including customer, employees and business partners
- Capturing, storing, protecting, and ensuring the **integrity of data assets**
- Ensuring the **quality** of data and information
- Ensuring the **privacy and confidentiality** of stakeholder data
- **Preventing unauthorized or inappropriate access, manipulation, or use of data and information**
- Ensuring **data can be used effectively to add value to the enterprise**



What is data?

Most definitions of data emphasize data role in representing facts about the world.

Many people (esp. IT) see data as any information stored in a digital format.

To be meaningful, data requires context:

- “Data is a means of representation. It stands for things other than itself” (Chisholm, 2010).
- “Data is both an interpretation of the objects it represents and an object that must be interpreted” (Sebastian-Coleman, 2013).

Understanding Data:

- Understanding context requires a representational system which includes a common vocabulary and relationships between components.
- If you understand the conventions of this system, you can interpret the data within it.
- “These conventions are often documented in a specific kind of data referred to as Metadata” (DMBOK)

Data is different from other resources



Other resources are valued because they are scarce.
Data is abundant.

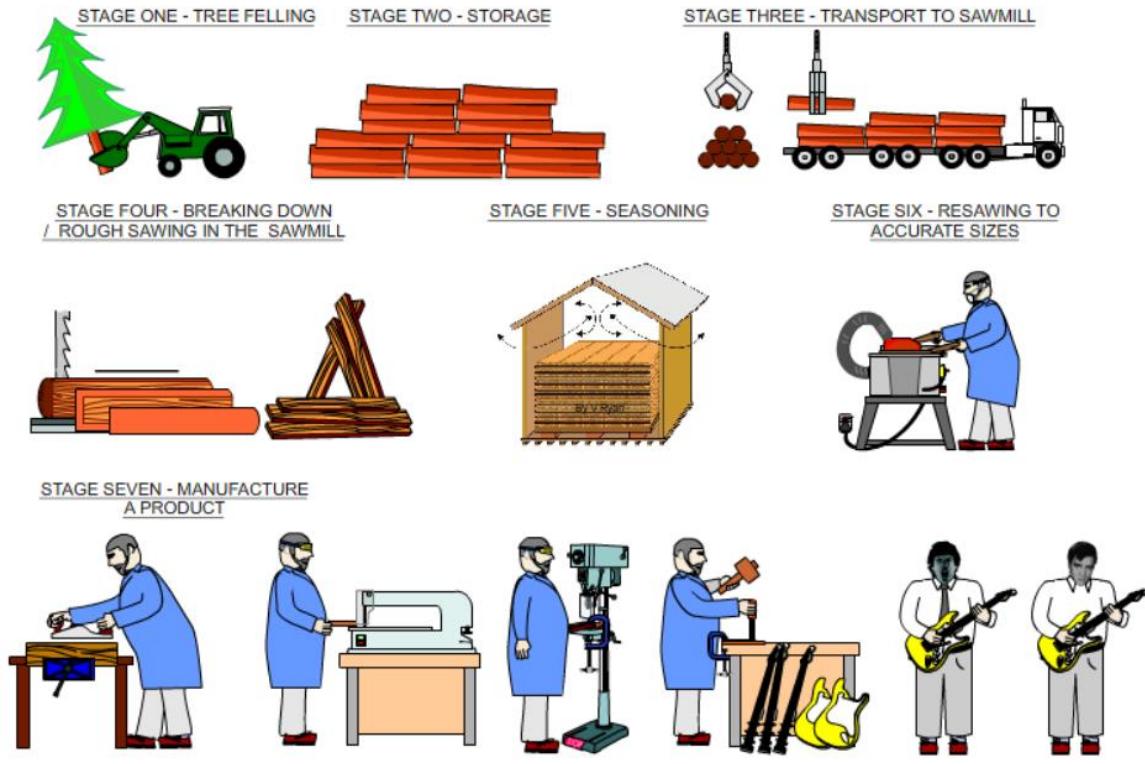
- Not tangible
- Durable – it does not wear out
- Its value depends on context, including the timeframe for use
- Easy to copy, share, transport, manipulate
- Non-fungible – one data set cannot easily be replaced with another data set
- Difficult to replace if lost or destroyed
- Not consumed when used – it can be stolen without being gone
- Same data can be used by multiple people at same time
- Many uses of data beget more data

(See Redman, 1996 and 2008)

Data vs. Information

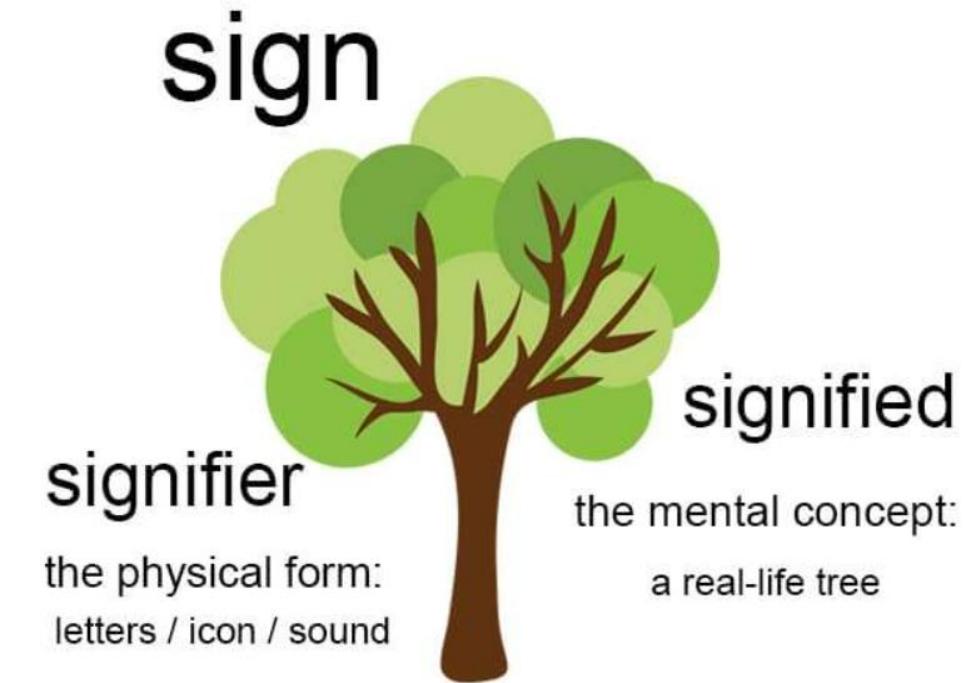
- Idea that “data = raw material” and “information=data in context” is problematic for data management
- Data does not simply exist; it is created
 - Importance of models, planning, etc.
 - A reason why there are different ways of representing the same idea through data
- It takes knowledge to create data in the first place
- “Data = Raw Material” idea implies that data and information are separate things
- Data is a form of information / information is a form of data
- Key Takeaway: *Data and Information* are usually used interchangeably in the context of Data Management. The words are used interchangeably in the DMBOK2

Below is a summary of processing natural wood, from logging / harvesting to manufacturing a product.



Why we need data management

- The interpreting data requires understanding the representation system in which it exists.
- People and organization may make different choices on how to represent concepts; these choices will impact how data is created and interpreted.
- There are multiple ways to represent the SAME IDEA
- This challenge is why we need Data Architecture, modeling, governance, stewardship, metadata, data quality management.
- Changes in technology have expanded the scope of this need as they have changed people's understanding of what data is.



Data as an asset



- An asset is an economic resource that can be owned or controlled, and that holds or produces value.
- Assets can be converted to money.
- Data is widely recognized as an enterprise asset, but the understanding of what that means is still evolving.
 - We don't yet have consistent models for assigning a dollar value to data
- Organizations rely on their data assets to make effective decisions and operate efficiently
- Many companies identify as “data-driven”.
- Being data-driven requires managing data efficiently and with professional discipline through a partnership between business leadership and IT.

Data management principles 1 of 2

SHORT VERSION

1. Data is **VALUABLE**
2. Data Management requirements are **BUSINESS REQUIREMENTS**
3. Data Management is **LIFE CYCLE MANAGEMENT**
4. Data Management requires **DIVERSE SKILLS**

DATA MANAGEMENT PRINCIPLES

Data is valuable

- Data is an asset with unique properties
- The value of data can and should be expressed in economic terms
- Effective Data Management requires leadership commitment

Data Management requirements are business requirements

- Managing data means managing the quality of data
- It takes Metadata to manage data
- It takes planning to manage data
- Data Management requirements must drive Information Technology decisions

Data management principles 2 of 2

Data Management is lifecycle management

- Different types of data have different lifecycle characteristics
- Managing data includes managing the risks associated with data

Data Management depends on diverse skills

- Data management is cross-functional
- Data management requires an enterprise perspective
- Data management must account for a range of perspectives

DM Challenges – Data Asset Valuation

Because data management has distinct characteristics derived from the properties of data itself. It also presents challenges in following these principles.

The things that make data different from other assets (refer to slide 8) also make it different to determine the monetary value of data

- Since data is unique to each organization valuation techniques will differ – value of data is contextual
- Establishing ways to associate financial value to data is critical for data management.
- Data not only represents value; it also represents risk.
- Low quality data is risky; so is data's potential to be misunderstood and/or misused.
 - Data Quality
 - Information Gaps (what we know/need to know)
 - Privacy / Security

Each organization must articulate general cost or benefit categories for the valuation of data assets. Examples:

- Cost of obtaining/storing data
- Cost of replicating data if lost
- Impact to organization if data missing/incorrect
- Cost of risk event/ risk mitigation
- Benefits of high-quality data
- Cost of data if sold
- Revenue form innovative uses of data

DM Challenges – Data Quality

- Ensuring data is of high quality is central to data management
- DQ historically has been an afterthought because data has been associated with IT
- Poor DQ is costly – IBM estimated cost of poor DQ in US was \$3.1 Trillion (Redman, 2015)

Costs of Poor Data Quality

- Scrap and rework
- Workarounds
- Low productivity
- Conflict
- Employee dissatisfaction
- Customer dissatisfaction
- Opportunity Costs
- Compliance costs, fines and reputational harm

Benefits of High Data Quality:

- Improved customer experience
- High productivity
- Reduced risk
- Act on opportunities
- Increased Revenue
- Competitive advantage

DM Challenges – Planning for better data

Deriving value from data requires planning!

Challenges in planning are organizational pressures as well as resources (time/money).

- Orgs can control how they obtain and create data.
- View data as a product and manage the product lifecycle
- Planning includes:
 - Collaboration
 - Strategic approach to architecture, modeling, and other design functions
- Understand impact of technology on data
- Prevent technological temptation from driving decisions about data
- Balance long and short-term goals.
- Data must be accounted for when making tradeoffs

Managing the data lifecycle requires systems thinking. Account for:

- How data connects to business processes
- Relationships between business processes and technology
- How design and architecture of systems impacts how data is produced/stored
- How data might be used to advance organizational strategy

DM Challenges – Metadata and Data Management

Reliable metadata is required to manage data as an asset.

Metadata is a form of data which must be managed.

- Metadata describes
 - What data an organization has
 - What the data represents
 - How it is classified
 - Where it came from
 - How it moves into & through the org
 - How it evolves over time
 - Who can use it
 - Its quality characteristics

EXAMPLES:

- Table and Column definitions
- Data Architecture Metadata
- Data Models
- Data Security Requirements
- Data Integration Standards
- Data Operational Processes
- Data Quality Standards
- Data Quality findings

DM Challenges – Metadata and Data Management

Reliable metadata is required to manage data as an asset.
Metadata is a form of data which must be managed

- Organizations that do not manage data well, typically do not manage their Metadata at all
- Metadata is required to understand
 - Data
 - The data lifecycle
 - The complex systems that contain data
- Metadata management often provides a starting point for improvements in data management overall

Note: Join us in August to discuss Chapter 12, Metadata Management

TYPES Of METADATA:

- Business Metadata
- Technical Metadata
- Operational Metadata

Note: These classifications can be confusing, since it is not clear whether they refer to who produces the metadata or who uses it. Focusing on who produces metadata is easier, since metadata is used by many people across roles.

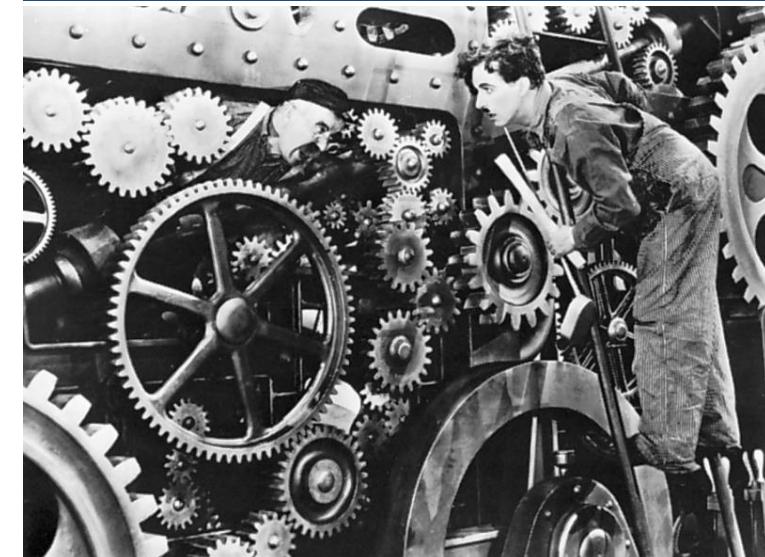
DM Challenges – Cross Functional

Data management is complex. It has a lot of different parts.

- Data is managed in different places across an organization by teams responsible for different phases of the data lifecycle
- Data Management requires
 - Collaboration and coordination
 - People with range of skills and perspectives
 - Ability to recognize how the pieces fit together
 - Ability to work towards common goals

Data Management Skills:

- Design Skills
- Technical Skills
- Data Analysis Skills
- Analytic Skills (Interpret data)
- Language Skills
- Strategic Thinking



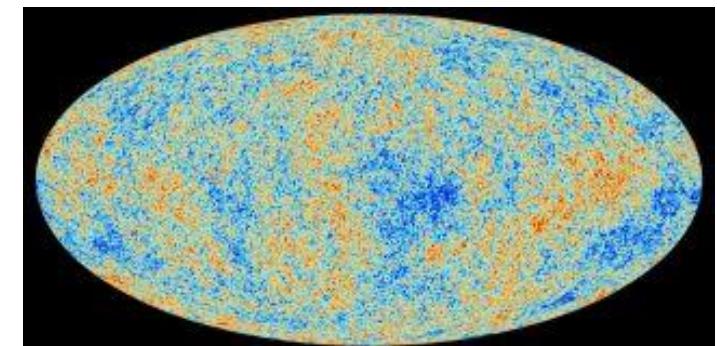
DM Challenges – Enterprise Perspective

Managing data requires understanding the scope and range of data within and across an organization and making it fit together in common sense ways.

- Data is not only unique to an organization; it can be unique to a department or business-unit
- Data is often not planned for beyond the immediate need
- Different departments may have different ways of representing the same concept – subtle or blatant differences can create challenges in managing data
- Stakeholders assume that an organization's data should be coherent
- Data Governance is vital to helping organizations make decisions about data across verticals

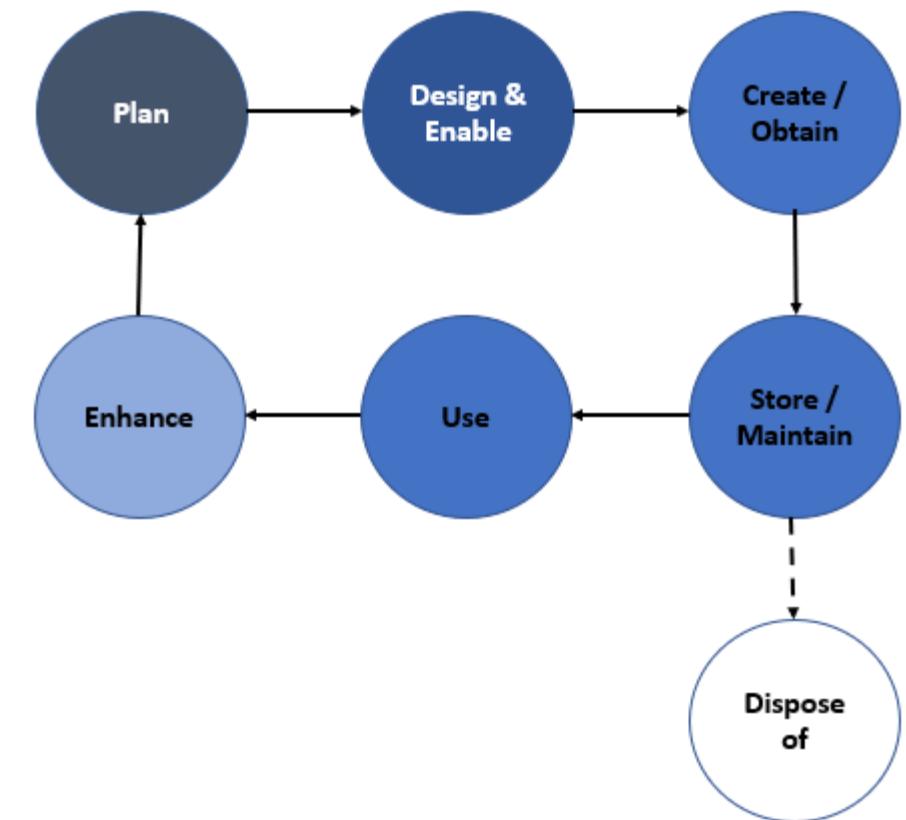
Other Perspectives:

- Internal / External data sources
- Legal and compliance requirements
- Knowledge of potential uses; who else will use it eventually
- Account for the fact data can be misused

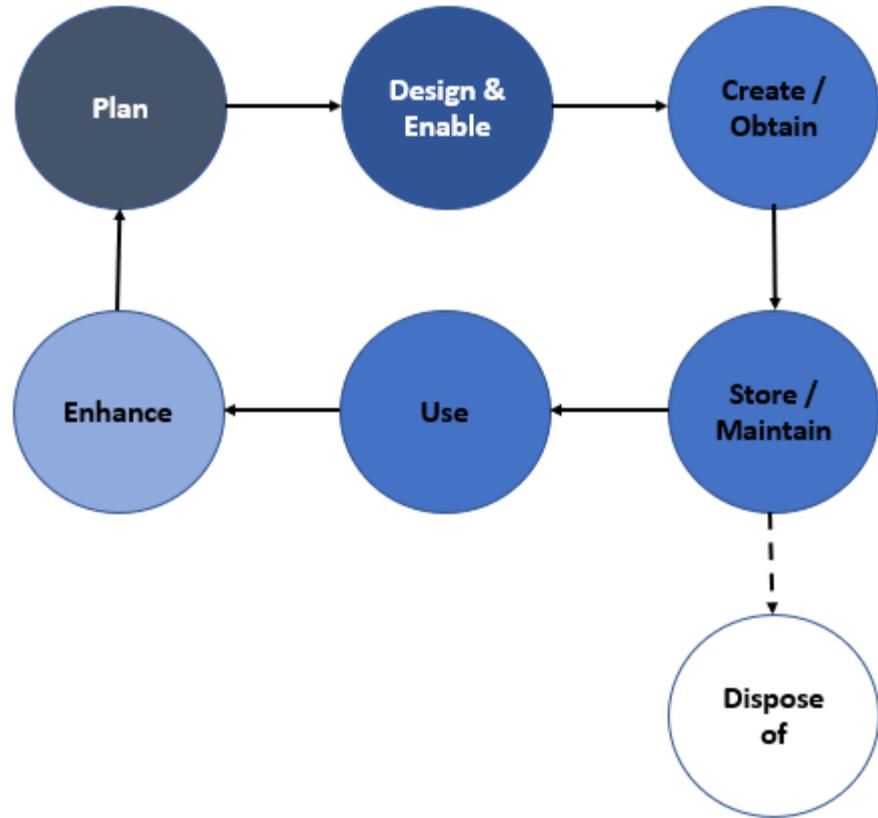


DM Challenges – Data Lifecycle

- Like other assets, data has a lifecycle.
 - To manage data, you must understand and plan for the lifecycle.
 - A strategic organization will not only define data content requirements, but also data management requirements.
-
- Data Lifecycle is based on the Product or Asset Management Lifecycle
 - Managing data involves a set of interconnected processes aligned with the data lifecycle
 - Specifics of a lifecycle can be complex
 - Data not only has a lifecycle it has lineage; it moves through the organization from the point of creation to multiple use points



DM Challenges – Data Lifecycle



Implications of Data Management on the Data Lifecycle (DLC):

- Creation and usage are most critical points in DLC
- DQ must be managed throughout the DLC
- Metadata Quality must be managed through the DLC
- Data Security must be managed throughout the DLC
- Data Management Efforts should focus on the most critical data

DM Challenges – Different Types of Data

Managing data is made more complicated by the fact that there are different types of data that have different lifecycle management requirements.

- Any management system needs to classify the objects that are managed
- Different types of data have different requirements, risks and roles within an organization
- DM tools are focused on aspects of classification and control

Classifications of data

- Data Domains
- Subject Areas
- Format
- Level of protection
- Location

Types of data:

- Transactional data
- Reference Data
- Master Data
- Metadata
- Category Data
- Resource Data
- Event Data
- Detailed Transaction Data

DM Challenges – Leadership and Commitment

Data Management is neither easy nor simple.

Few organizations do it well, so it is a source of untapped opportunity.

To become better it requires vision, planning, and willingness to change.

- Most organizations recognize their data as an asset
- Far from being data-driven
- Don't know what data they have; what data is critical
- Confuse data and IT; mismanage both
- Do not take a strategic approach

CDO can lead data management activities – lead initiatives and cultural change that enables a more strategic approach to data

DM Challenges – Data Management Strategy

Data Strategy

- Comes from the business strategy; what data is needed, how to get it, how it will be managed and utilized.

Data Management Strategy

- Data Strategy requires a supporting Data Management Strategy – a plan for maintaining and improving the quality of data, integrity of data, access and security while mitigating risks and addressing Data Management challenges.
- Typically owned by CDO and enacted through a Data Governance team, supported by a Data Governance Council

Strategic planning includes:

- Vision
- Business Case
- Guiding Principles
- Mission and long-term goals
- Measures
- SMART* objectives
- Roles & Responsibilities
- Descriptions of program components & initiatives
- Prioritize program with scope boundaries
- Roadmap

Deliverables:

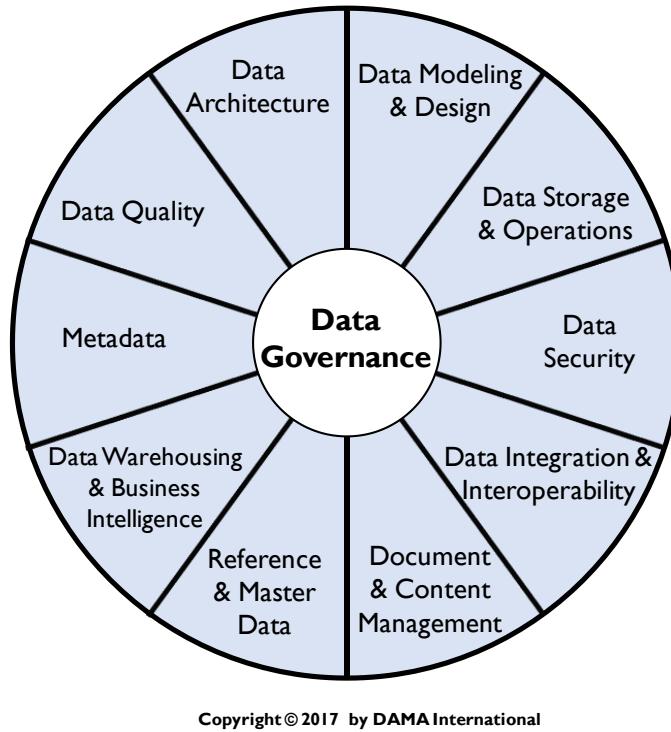
- DM Charter
- DM Scope Statement
- DM Implementation Roadmap

Data Management Frameworks

DAMA was founded to address the challenges of data management.

The DMBOK supports the DAMA mission by:

- Providing a functional framework
- Establishing and common vocabulary
- Serving as a fundamental reference guide

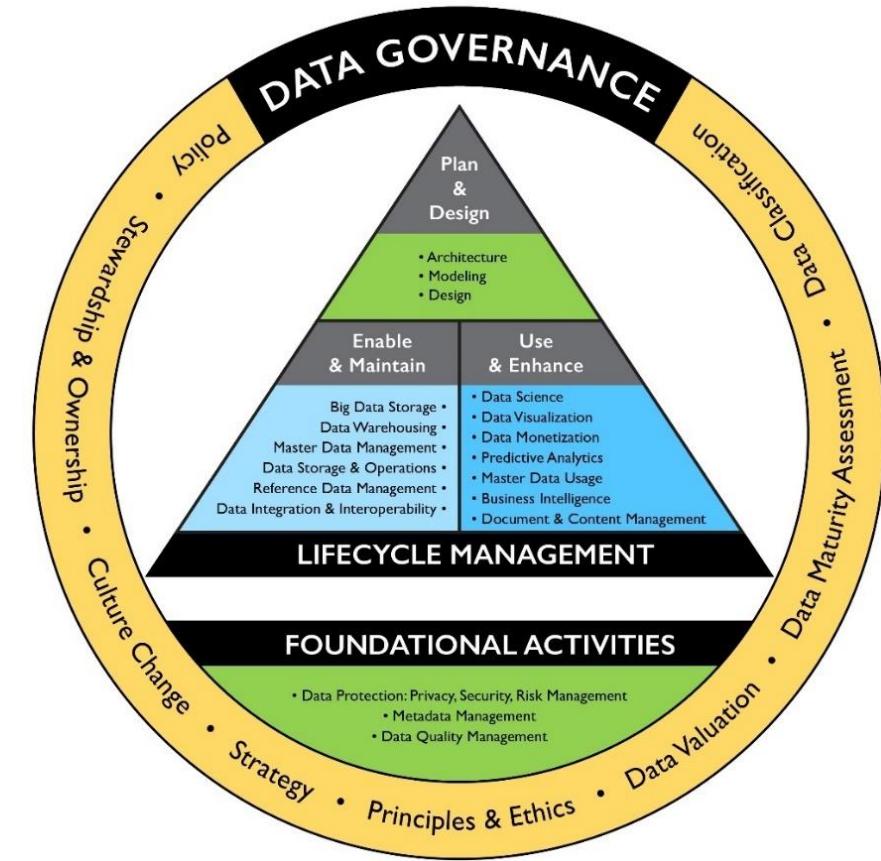


The 11 Knowledge Areas in the DAMA-DMBOK describe the scope of Data Management:

- Data Governance
- Data Architecture
- Data Modeling and Design
- Data Storage and Operations
- Data Security
- Data Integration and Interoperability
- Document and Content Management
- Reference and Master Data
- Data Warehousing and Business Intelligence
- Metadata
- Data Quality

Data Management Frameworks

- Data management involves a set of interdependent function, each with its own goals, activities and responsibilities.
- Frameworks are developed at different levels of abstraction to provide perspectives to help us to understand data management comprehensively and see relationships between components
- Many factors influence DM approach such as: industry, range of data, culture, maturity level, strategy, vision and challenges
- The DMBOK is organized around DAMA's 11 Knowledge Areas, but it also includes other frameworks for reference:
 - Strategic Alignment Model
 - The Amsterdam Information Model
 - DAMA-DMBOK Framework
 - DMBOK Pyramid
 - DAMA Data Management Framework Evolved (the Evolved Wheel) which arranges the DAMA Knowledge areas in relation to lifecycle and foundational activities.



Studying

- Understand the characteristics of data
- Understand the goals and principles of data management and the challenges to meeting them.
- Understand the DAMA Wheel

Discussion / Q&A



NEXT SESSION



| Topic |
|--|
| Chapter 1: Data Management |
| Chapter 2: Data Handling Ethics |
| Chapter 3: Data Governance |
| Chapter 4: Data Architecture |
| Chapter 5: Data Modeling & Design |
| Chapter 6: Data Storage & Operations |
| Chapter 7: Data Security |
| Chapter 8: Data Integration & Interoperability |
| Chapter 9: Document & Content Management |
| Chapter 10: Reference & Master Data |
| SUMMER BREAK |
| Chapter 11: Data Warehousing & Business Intelligence |
| Chapter 12: Metadata Management |
| Chapter 13: Data Quality |
| Chapter 14: Big Data & Data Science |
| Chapter 15: Data Management Maturity Assessment |
| Chapter 16: Data Management Organization & Role Expectations |
| Chapter 17: Data Management & Organizational Change Management |

What would Inman do?

How have developments in technology increased risks associated with unethical use of data?

Part 2: Data Ethics

Principles, Practices & Processes Protecting People's Personal Privacy



Brainscape Digital Flashcards - <https://www.brainscape.com/p/2UTIR-LH-8SZ2J>

Screenshot of the Brainscape Digital Flashcards interface for the "CDMP Exam Prep Flashcards" class.

The top navigation bar includes:

- Brainscape logo
- My Classes
- Find Flashcards
- Make Flashcards
- Educators
- Companies
- About
- Lynn Noel profile

The main content area displays:

CDMP Exam Prep Flashcards

Lynn Noel invited you to study.

DECKS IN THIS CLASS (2):

- Chapter 1: Data Management** (0 Cards) Call for Volunteers!
- Chapter 2: Data Handling Ethics** (49 Cards) Click to launch

Sample Cards:

what is the dmbok definition of ethics,
name at least four of the eight examp...,
what is the dmbok definition of data ...

Current Learners (1)

Lynn Noel
0 cards viewed

Share Class Free

Message The Author

Help

Brainscape believes in an

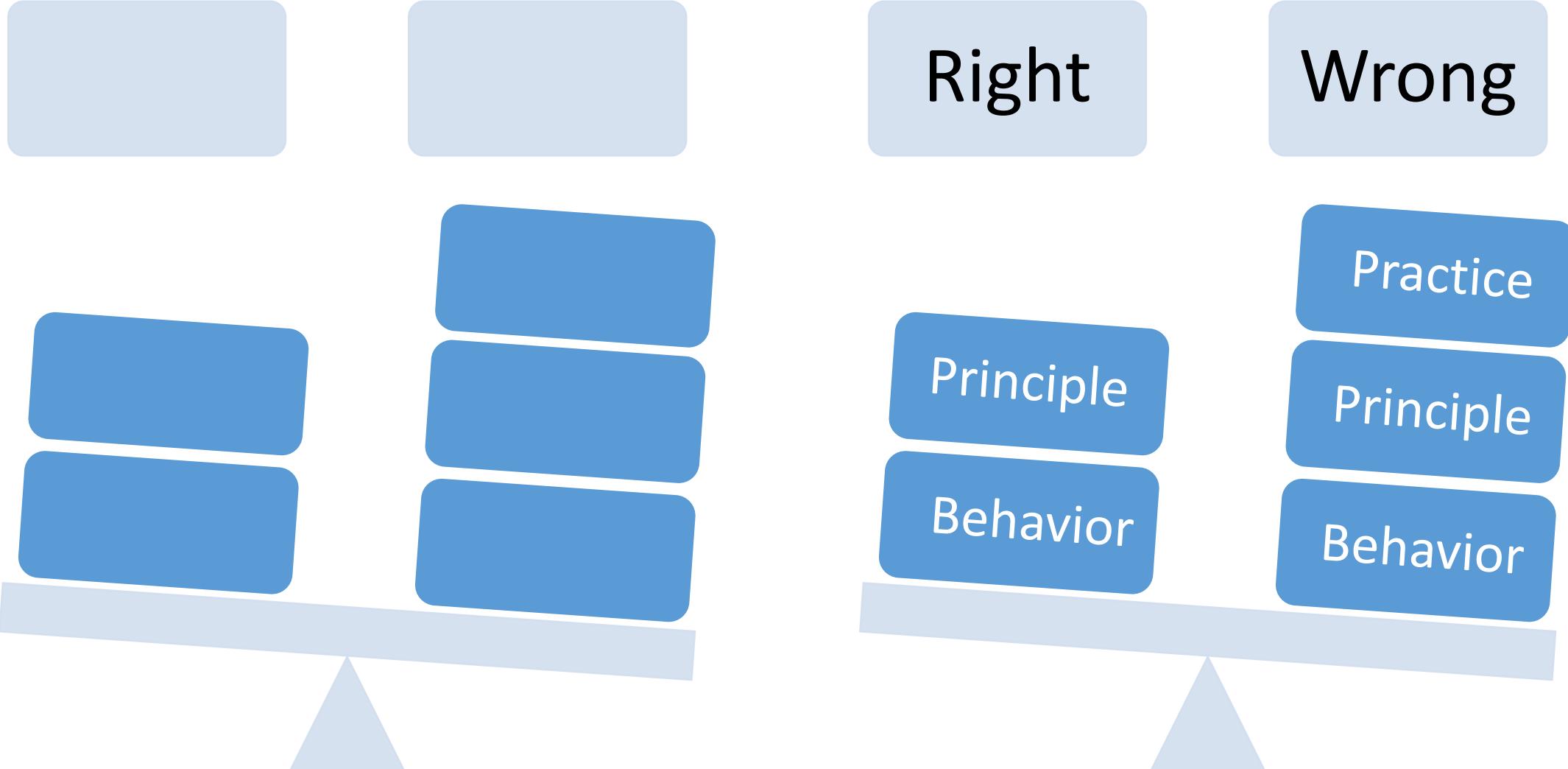
CDMP Exam Prep

Flashcard maker: Lynn Noel

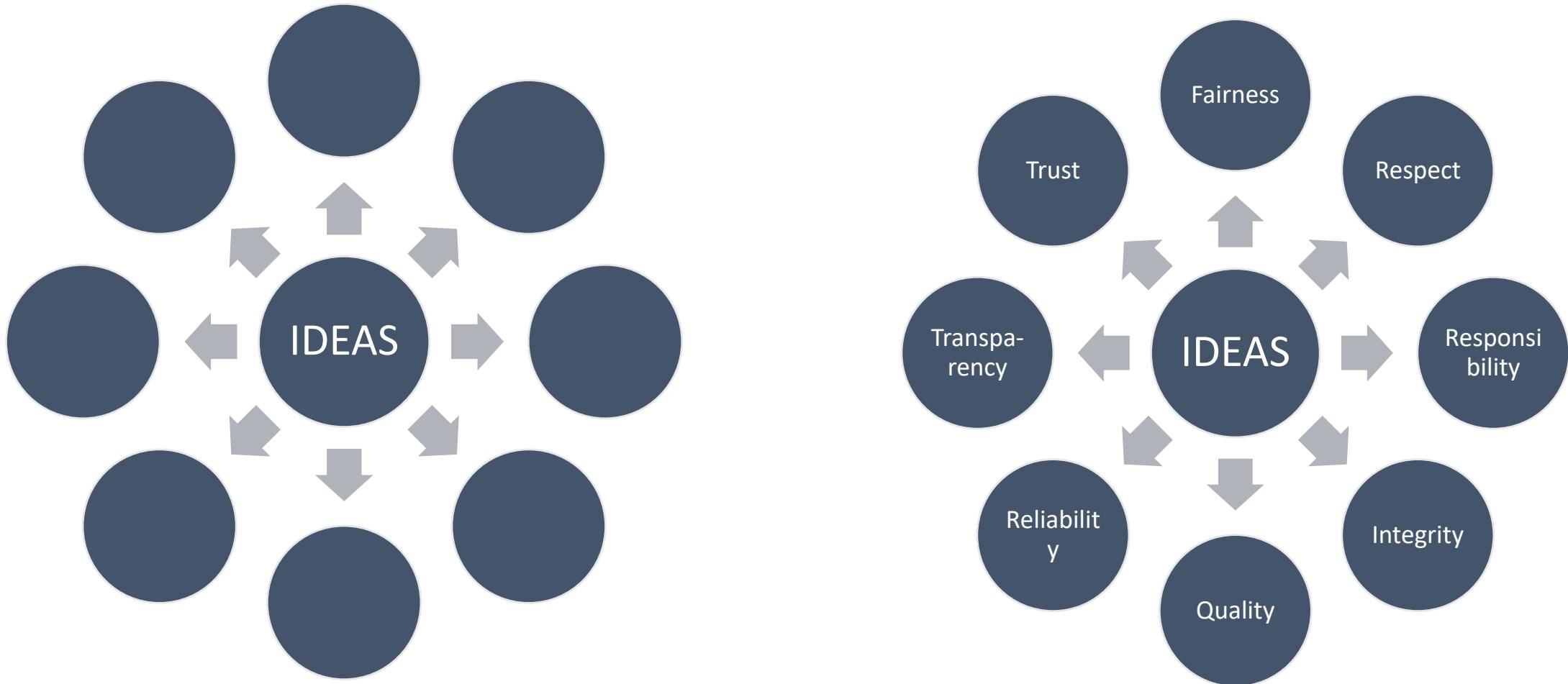
2 DECKS - 49 CARDS

Adaptive flashcards that help you learn faster using spaced repetition. Study

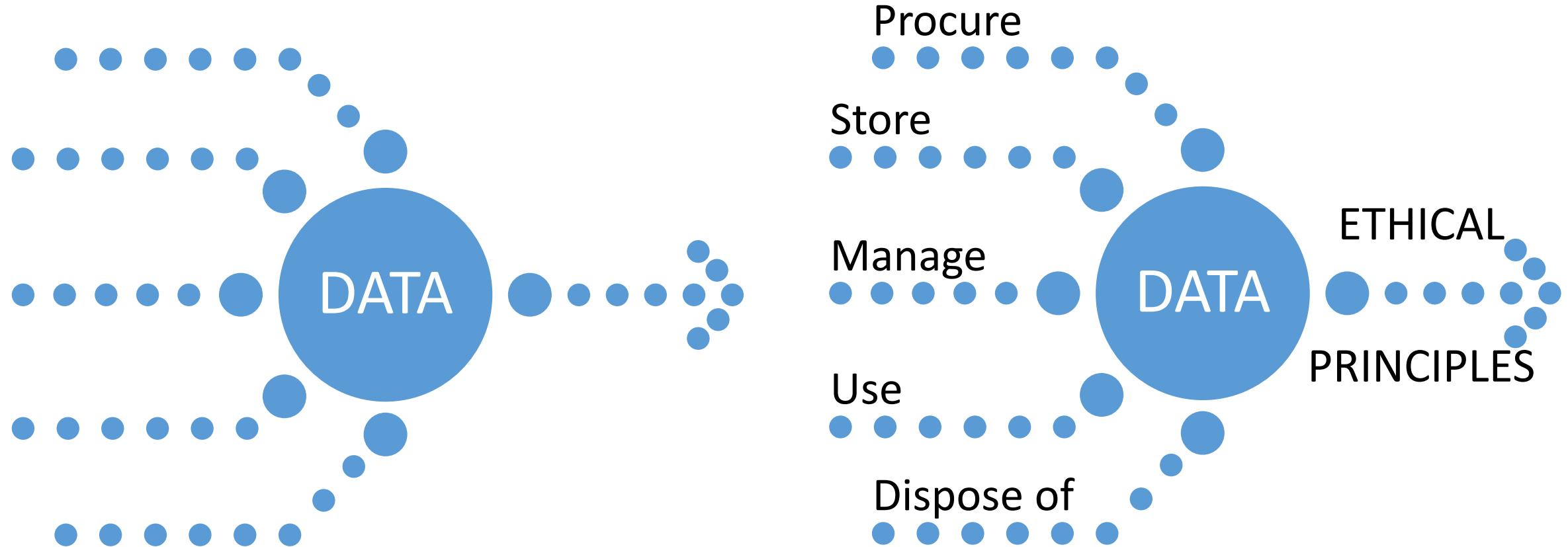
What is the DMBok **definition** of ethics?



Name at least four of the seven example **ideas** on which ethical principles are focused.



What is the DMBoK definition of **data handling** ethics?



What are four **reasons** that DAMA says that data handling ethics are important?



Long-term success

Loss of reputation and customers



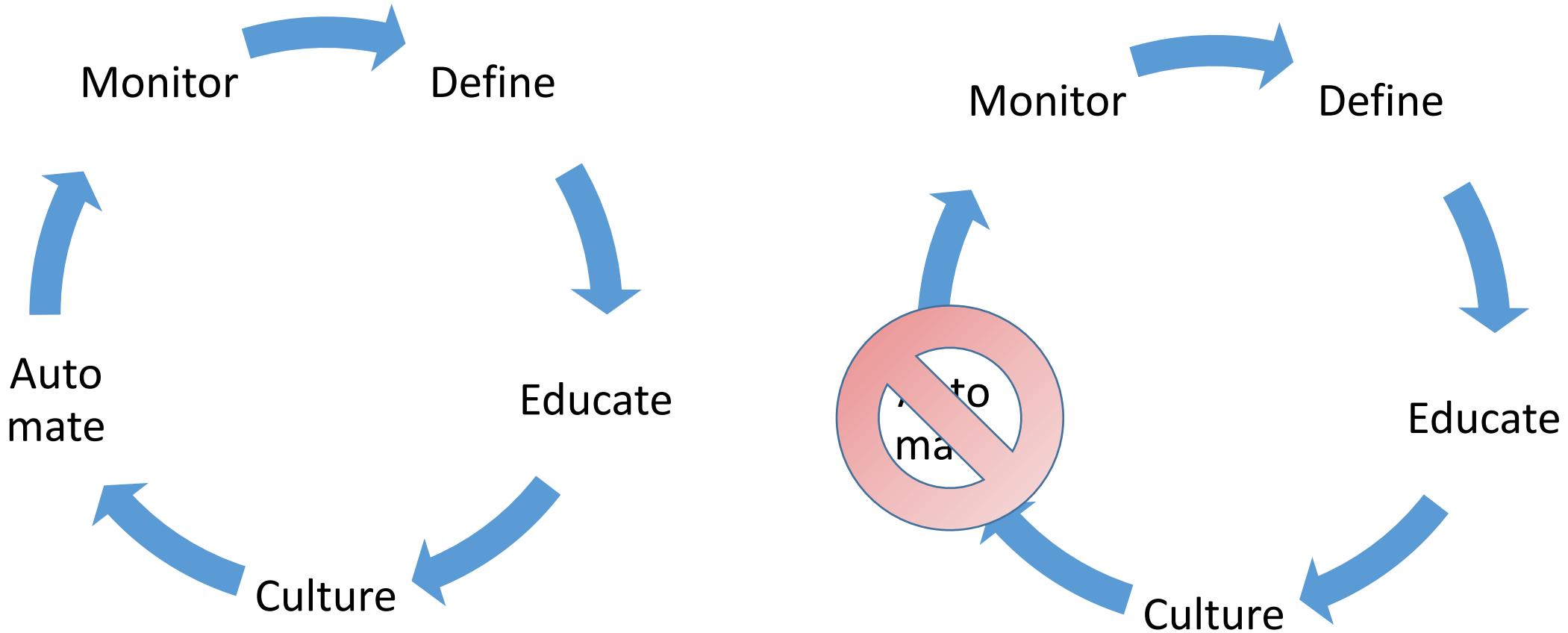
Unethical practices may be illegal

Social Responsibility

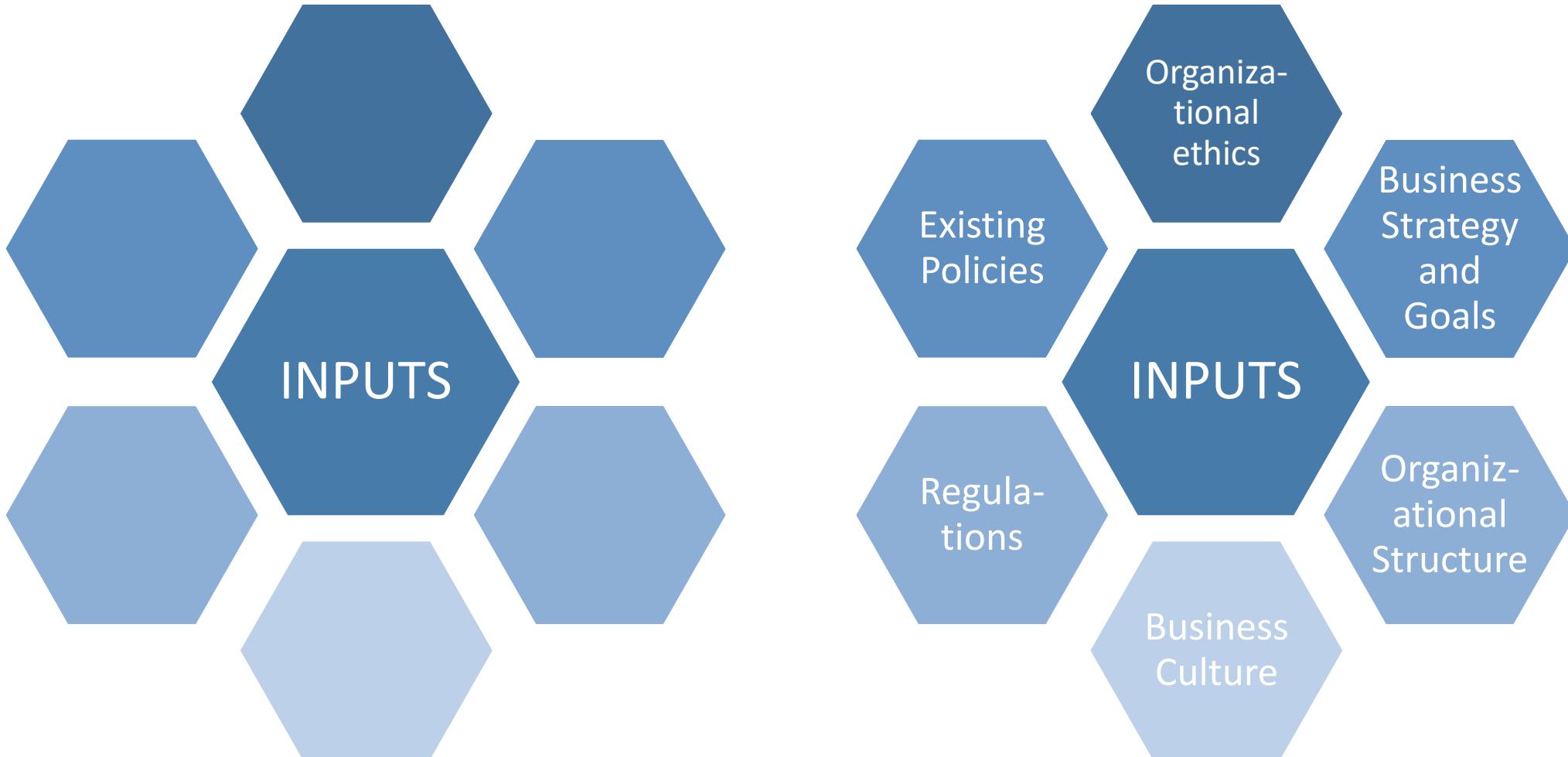
List three core **concepts** of data handling ethics from the DMBoK.



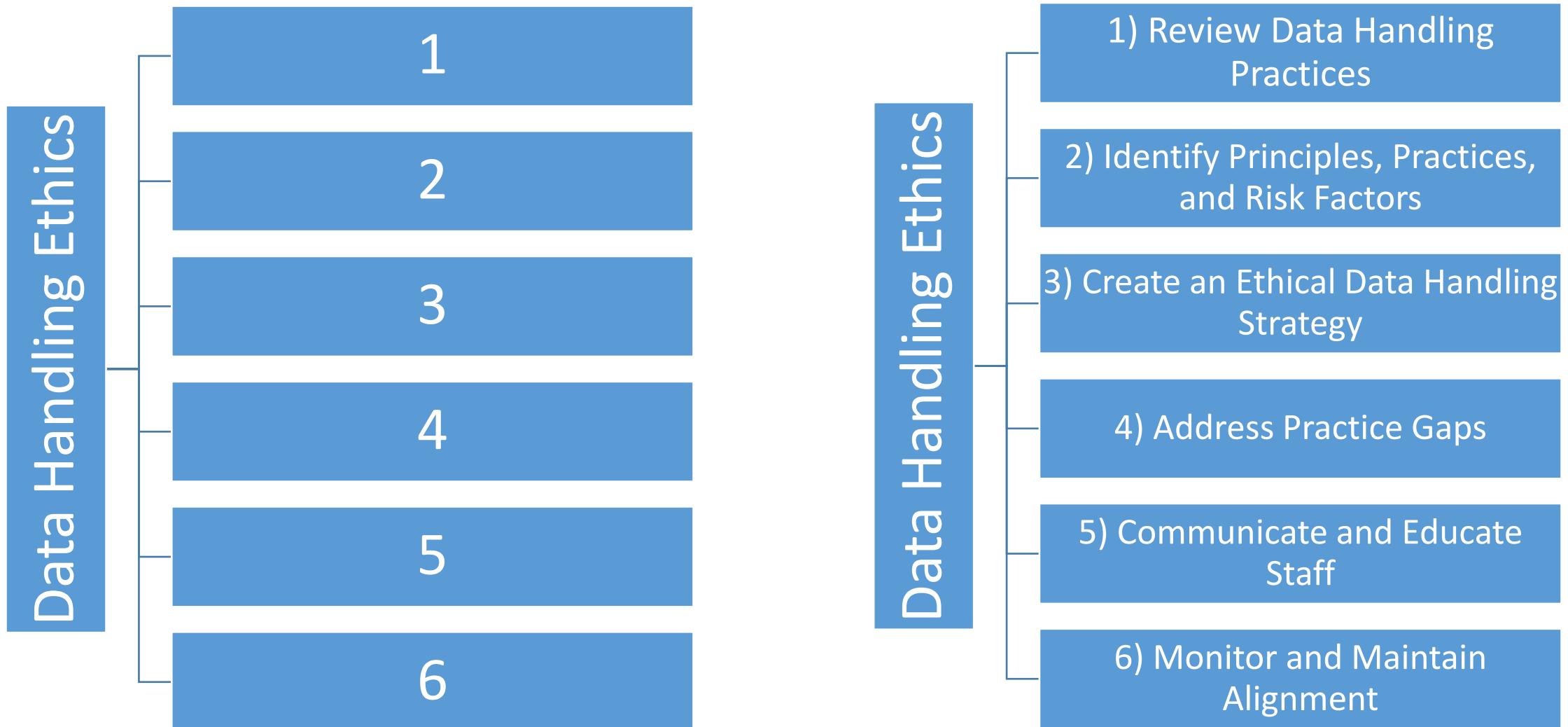
Which one of these goals is NOT in the DMBoK as a **business driver** for data handling ethics?



Name at least three of the six **inputs** needed to define data handling ethics for an organization.



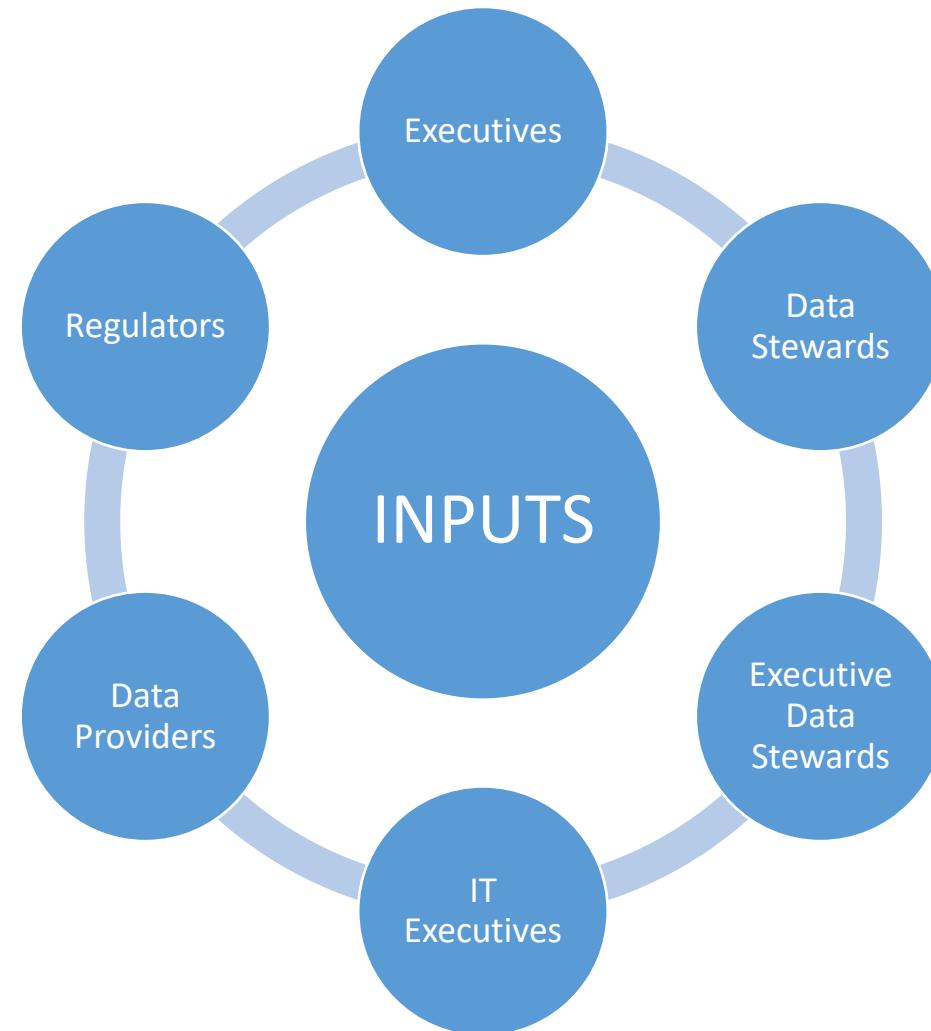
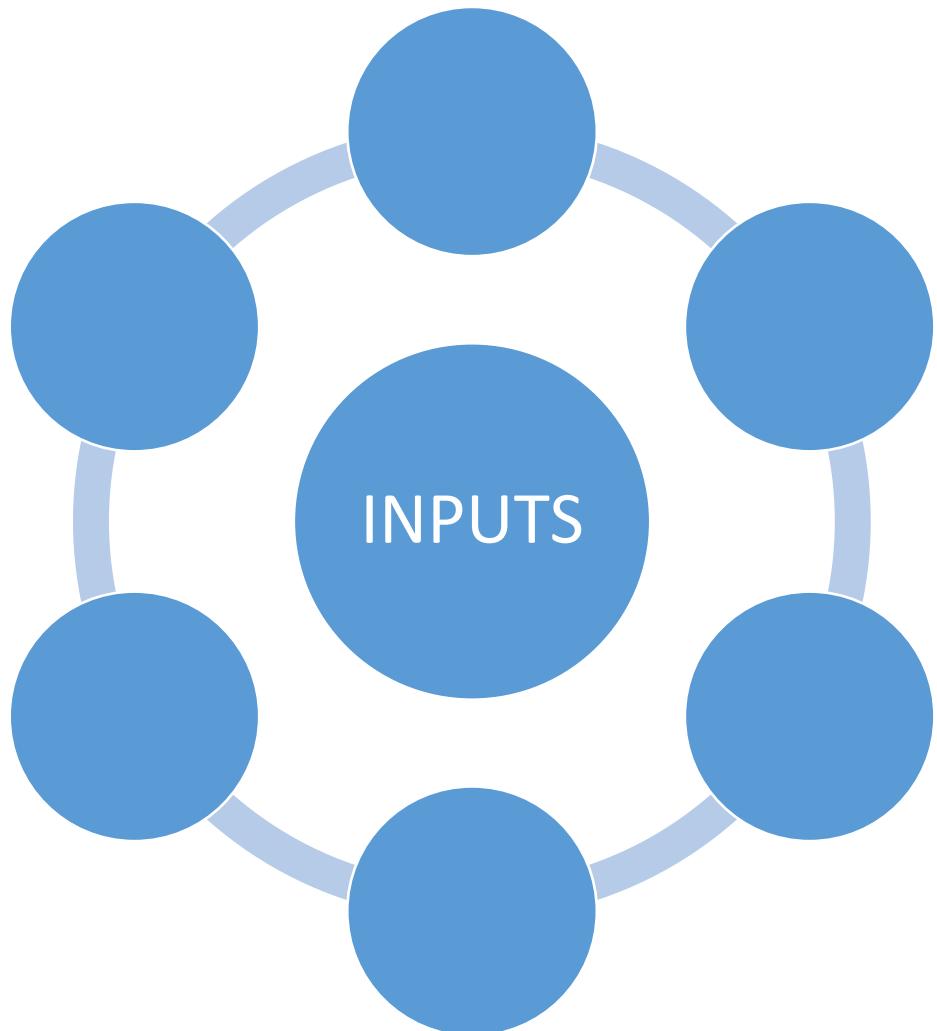
What are the six core **activities** of data handling ethics?



Name at least five of the nine **deliverables** that the DMBOK recommends for a data handling ethics program.

| | | | | | |
|--|--|--|---------------------------------------|--------------------------------|----------------------------------|
| | | | Current Practices and Gaps | Ethical Data Handling Strategy | Communication Plan |
| | | | Ethics Training Program | Ethical Corporate Statements | Awareness of Ethical Data Issues |
| | | | Aligned Incentives, KPIs, and Targets | Updated Policies | Ethical Data Handling Reporting |

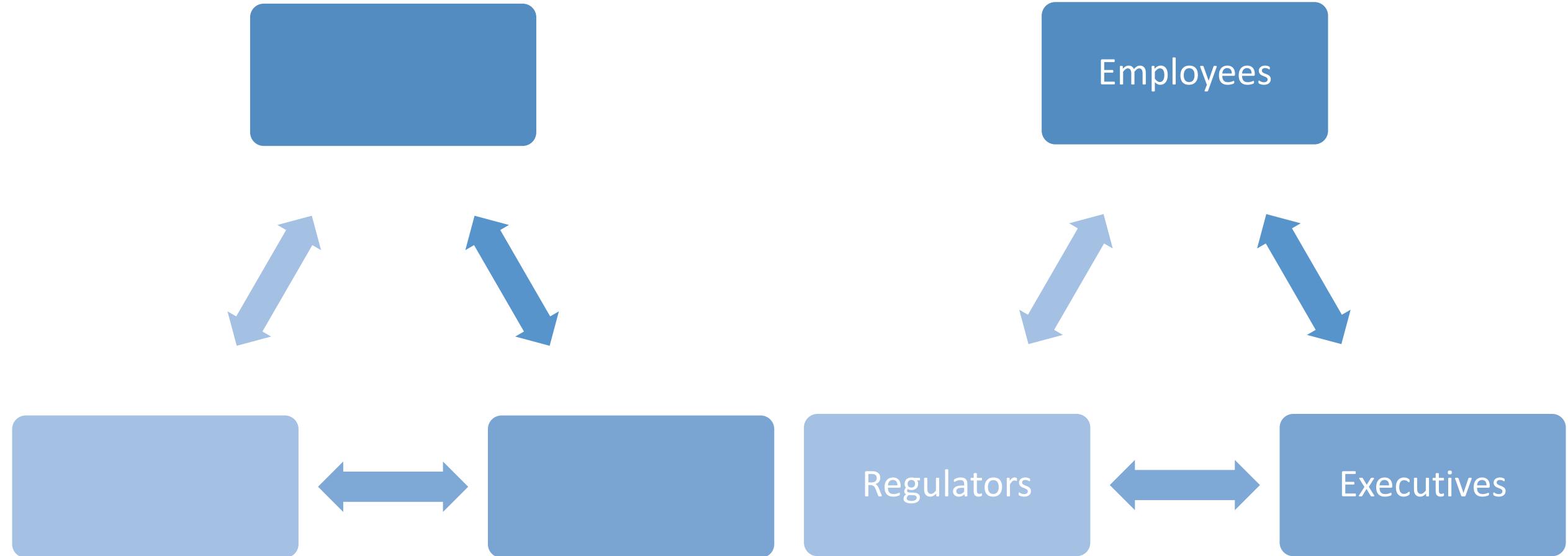
Name at least three of the six **key stakeholders** needed to supply the **inputs** to an ethical data handling program



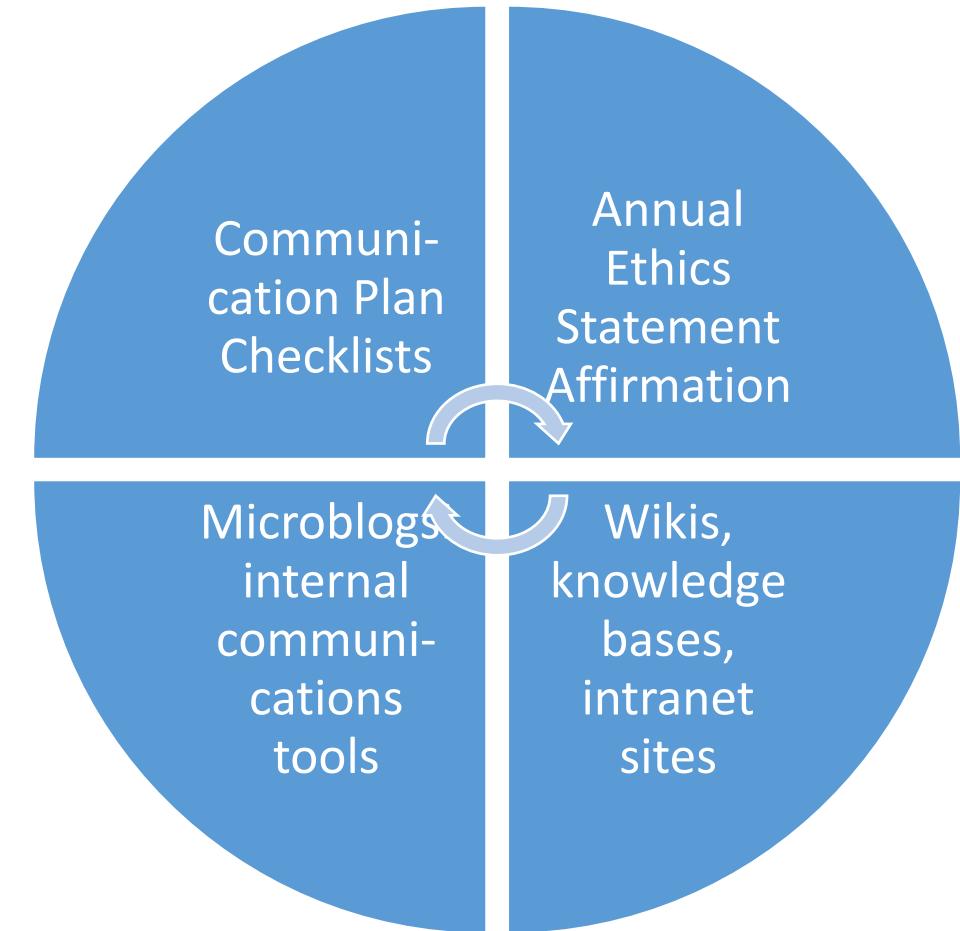
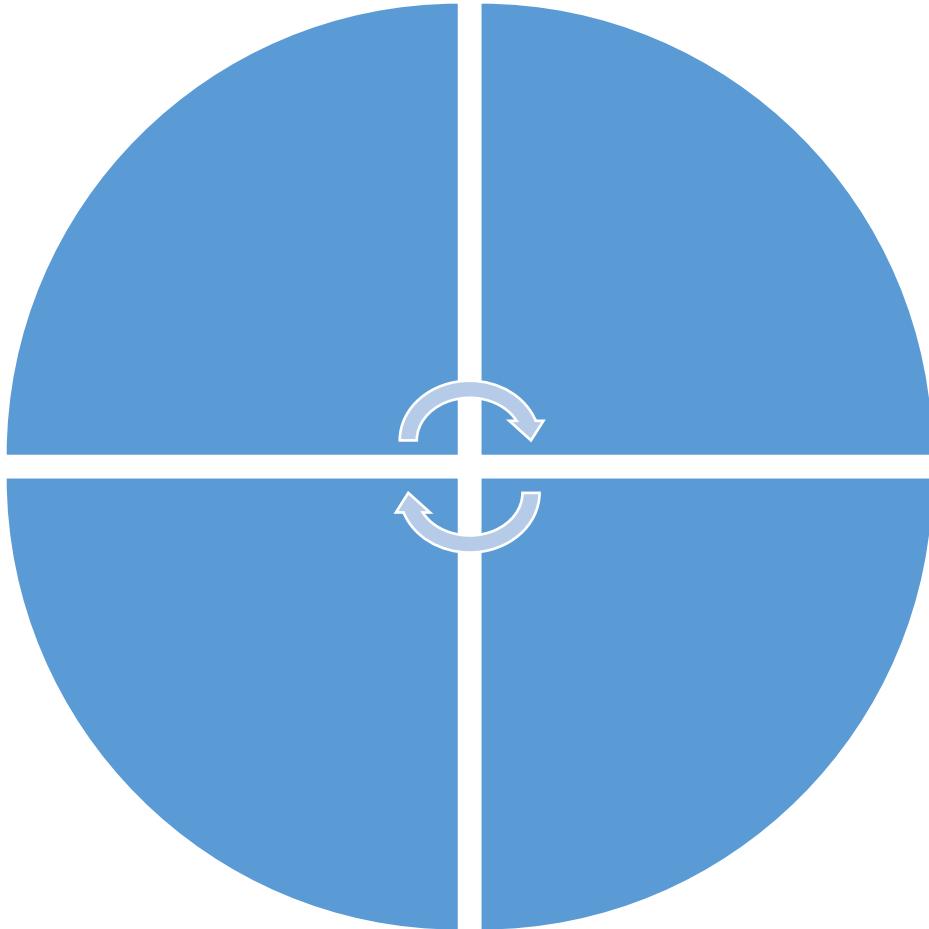
Name at least four of the seven **key stakeholders** needed to conduct the **activities** of an ethical data handling program



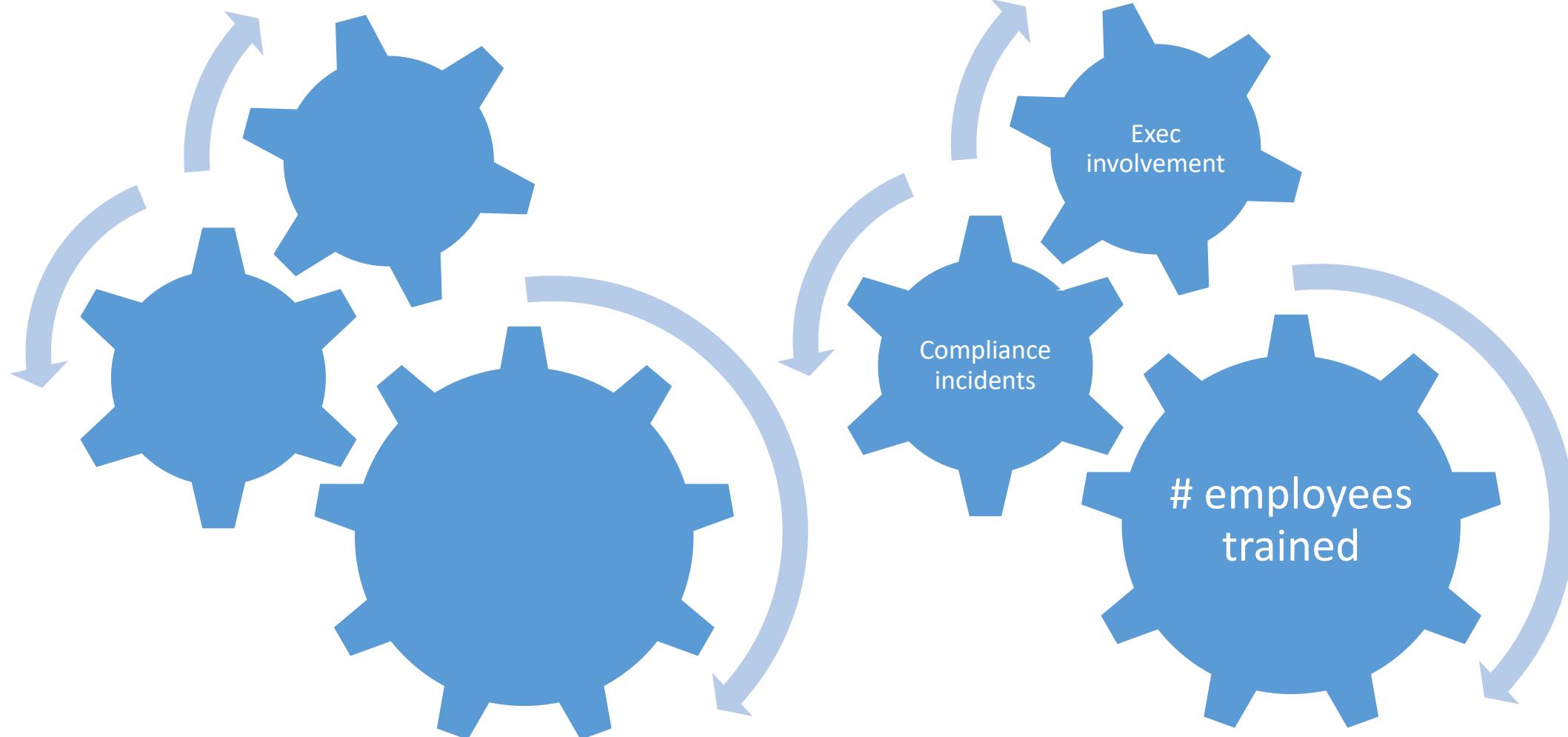
Name the three **key stakeholders** recommended as **consumers** of an ethical data handling program



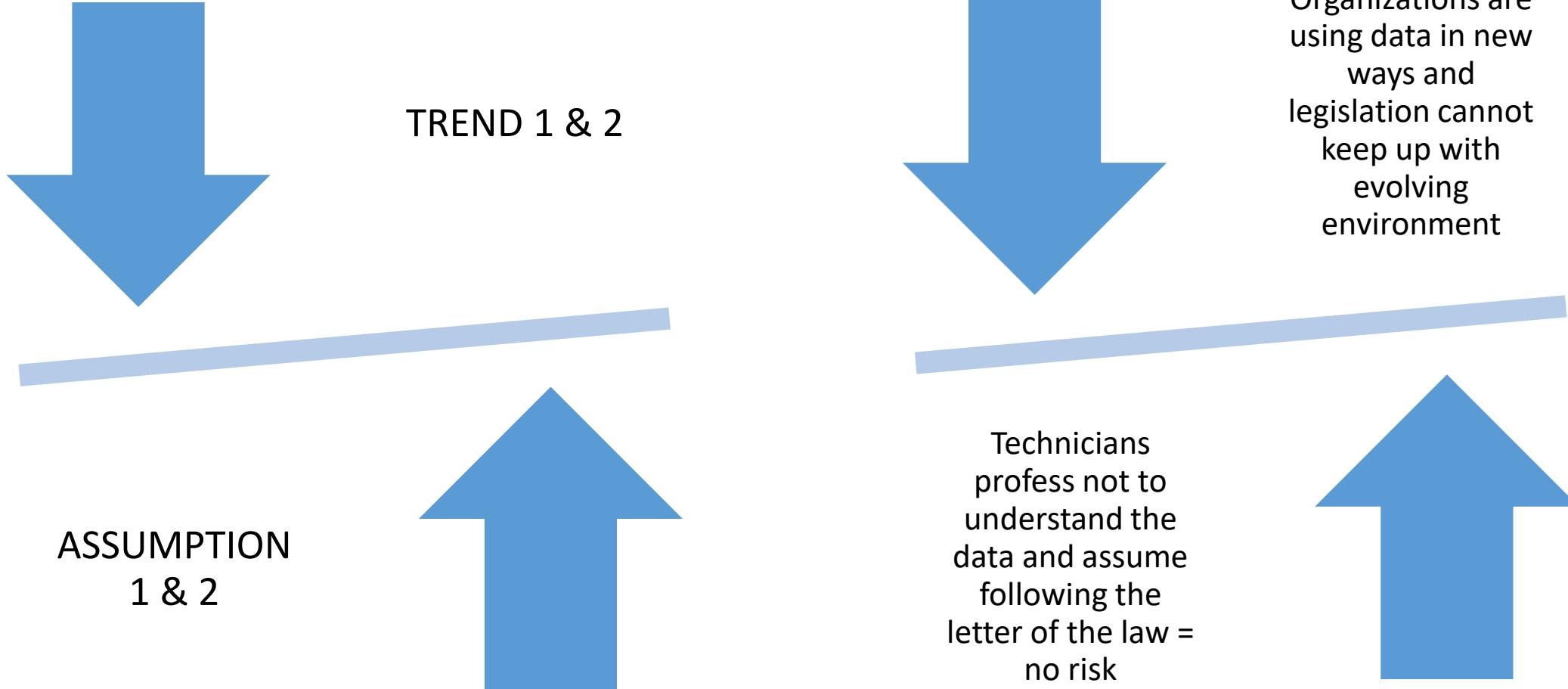
List four core techniques and tools used as **technical drivers** for a data handling ethics program



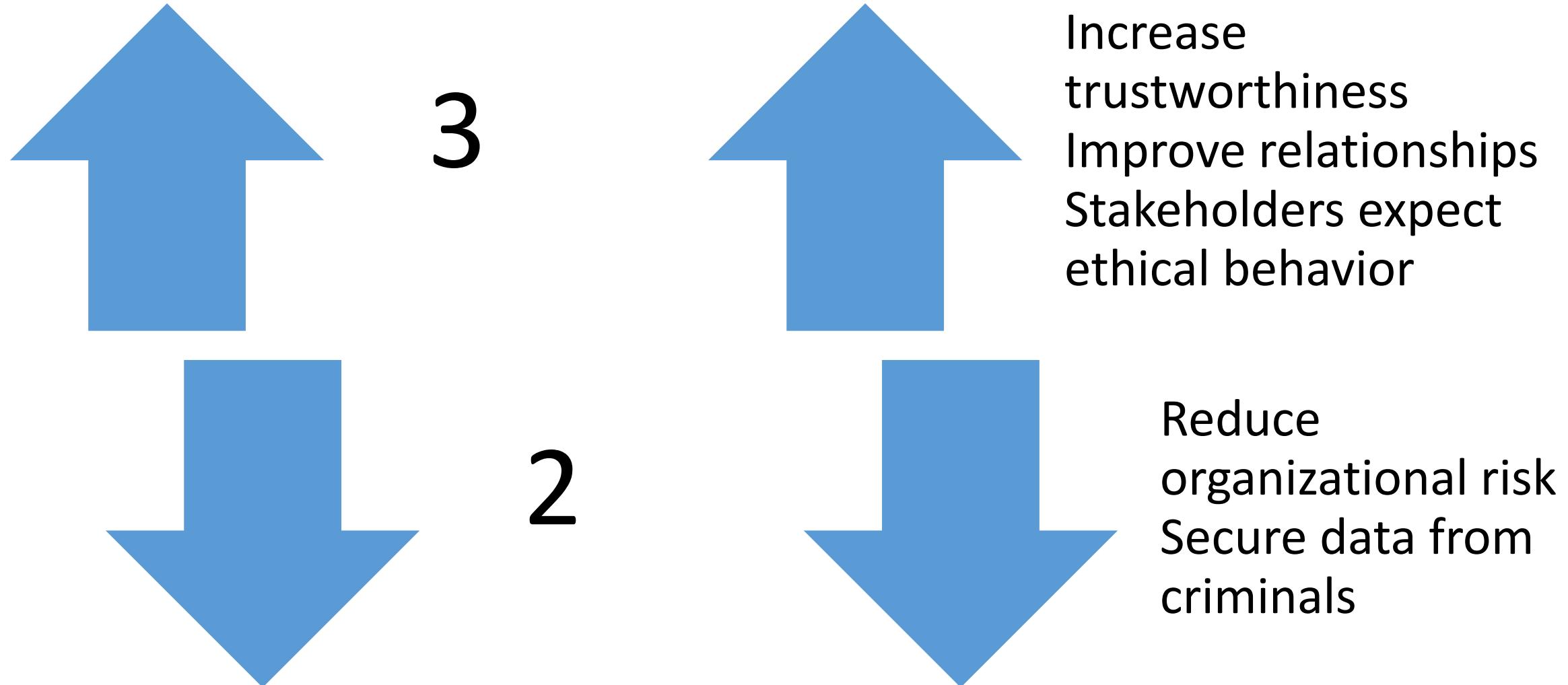
List three key **metrics** of a successful ethical data handling program



What are two **assumptions** that lead organizations to fail at data ethics, and two **trends** that make it important to succeed?



What are five key **business drivers** (3 opportunities and 2 threats) that motivate a data ethics program?



List the six groups of essential concepts for data ethics in the DMBok.

Ethical Principles for Data

Principles Behind Data Privacy Law

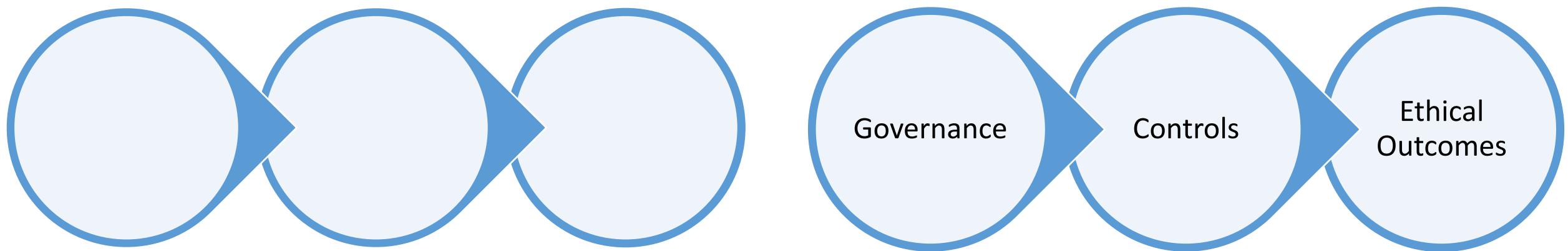
Online Data in an Ethical Context

Risks of Unethical Data Handling Practices

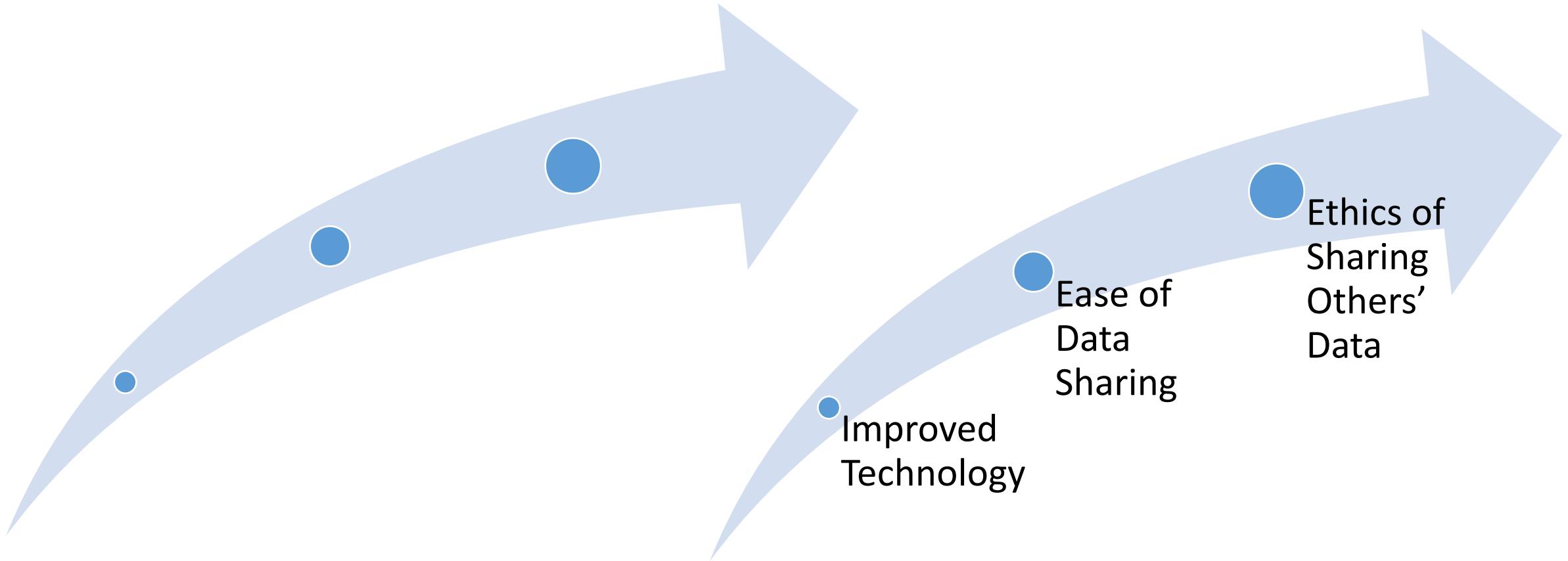
Establishing an Ethical Data Culture

Data Ethics and Governance

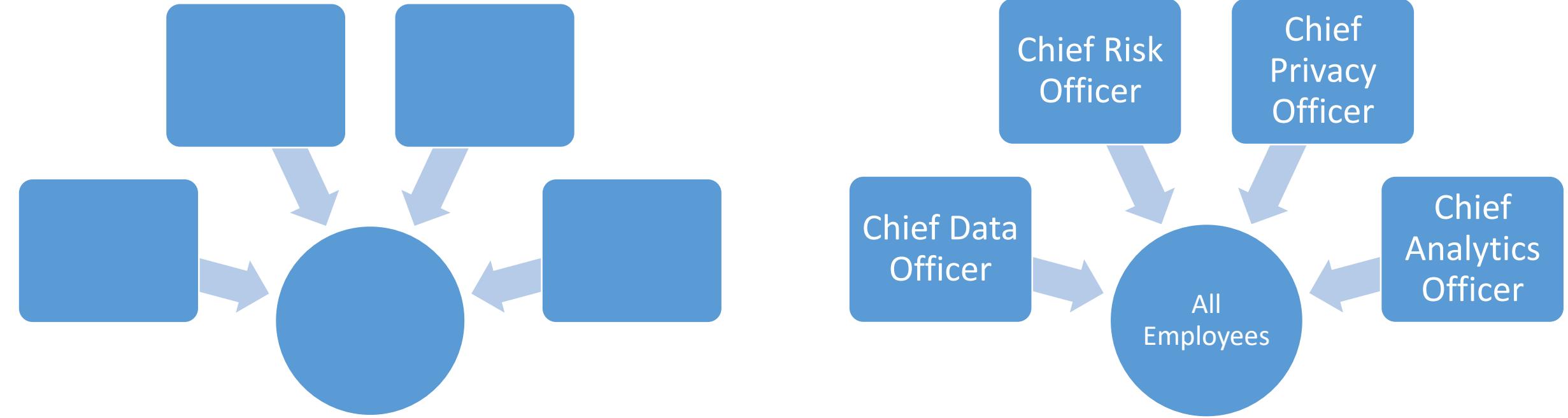
What is entailed in creating an ethical **culture** for data handling?



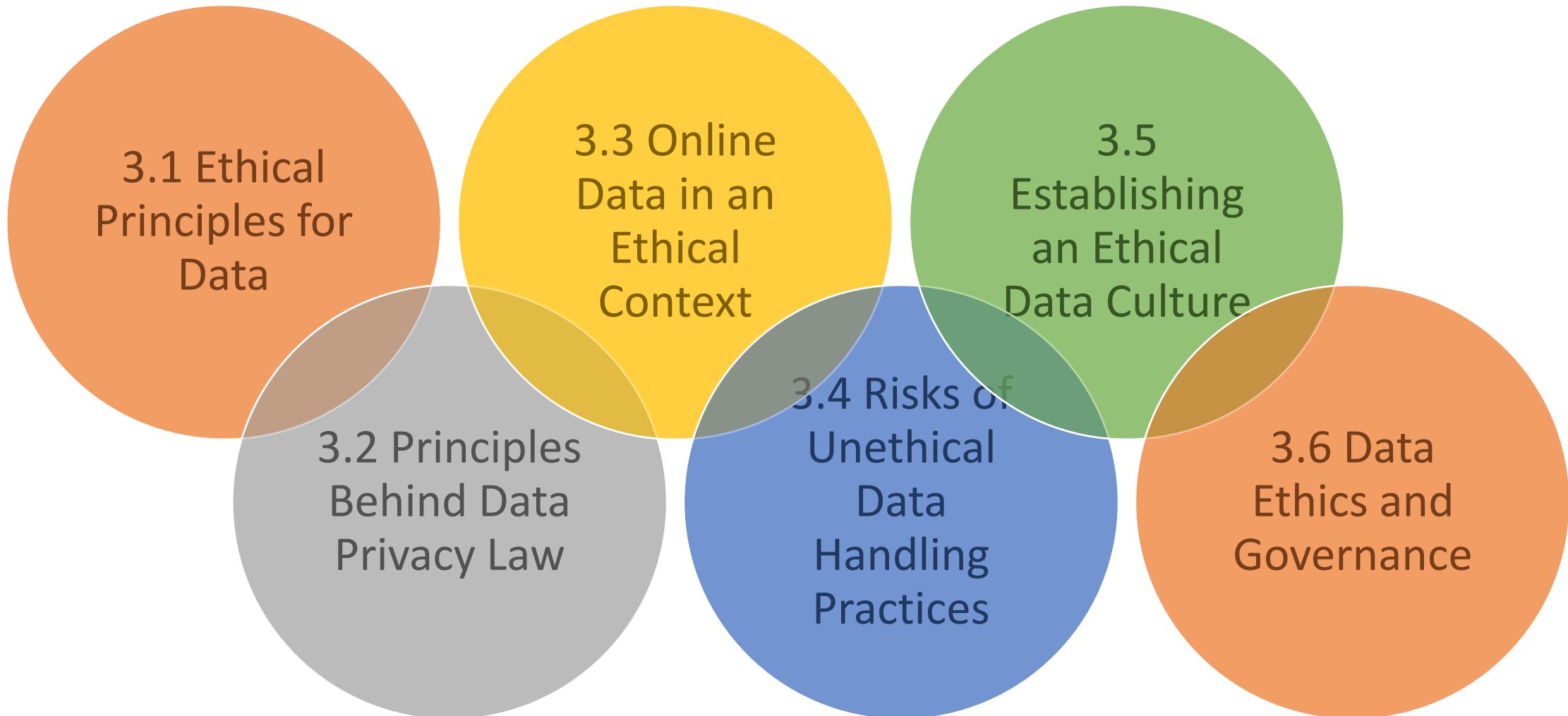
How does data **ownership** influence data handling ethics?



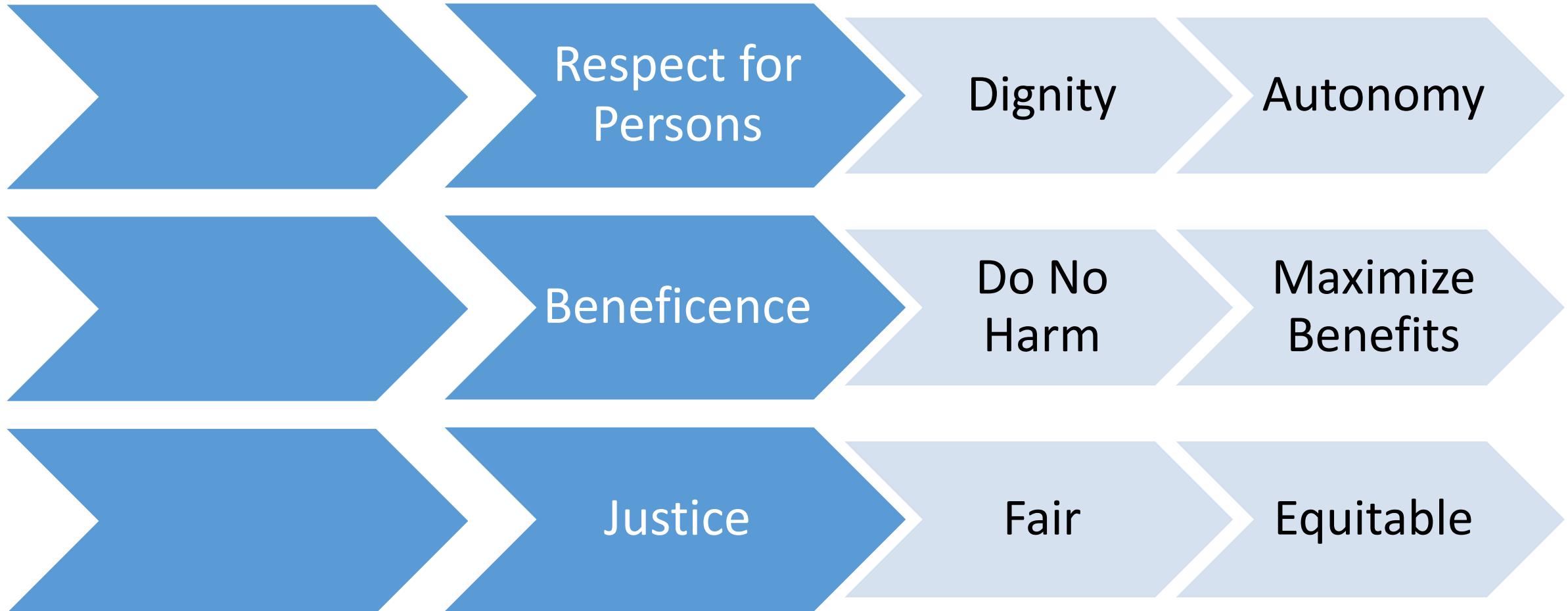
Name five **emerging roles** with responsibilities for data handling ethics



What are the six **essential concepts** that the DMBok gives for data handling ethics?



Name and define three tenets of **bioethics** that provide a starting point for principles of data ethics



List the European Data Protection Supervisor's four pillars required for an information ecosystem that ensures ethical treatment of data

EDPS

EDPS

Future-oriented regulation

Accountable controllers

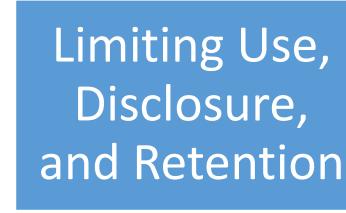
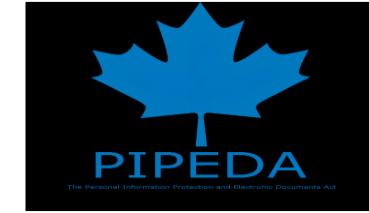
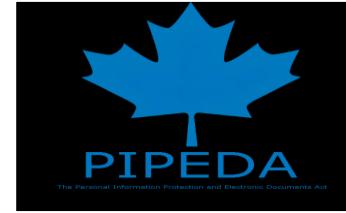
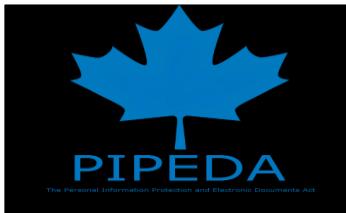
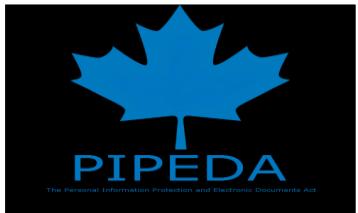
Privacy-conscious

Empowered individuals

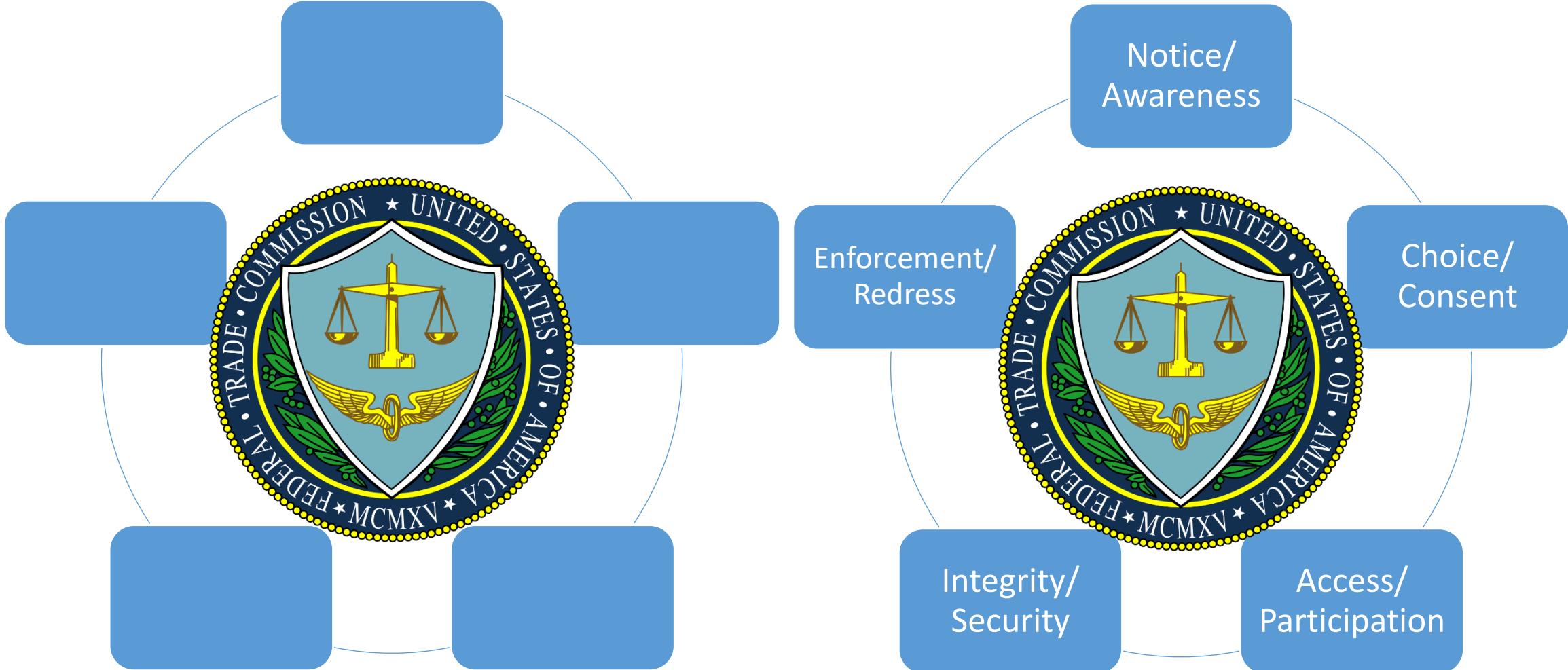
What are the seven principles of the General Data Protection Regulation of the EU (GDPR)?



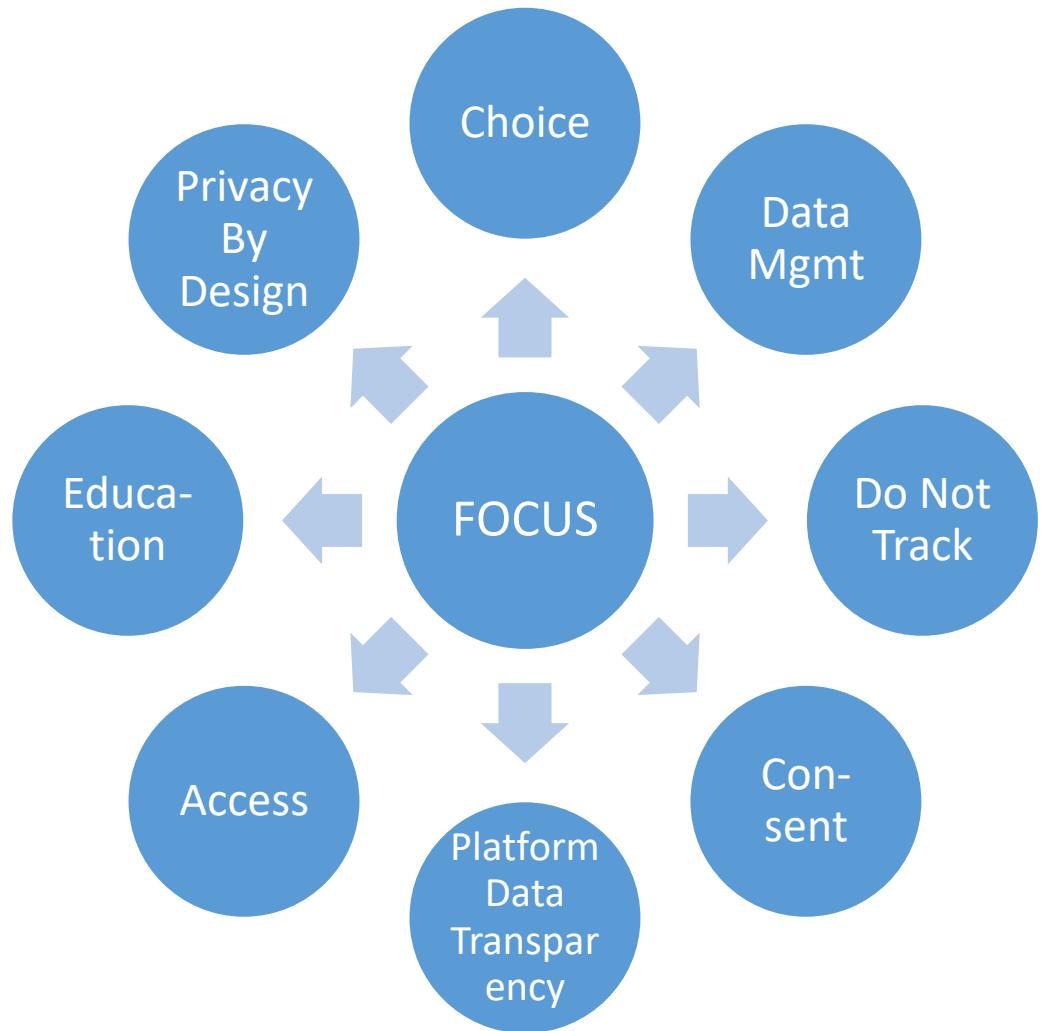
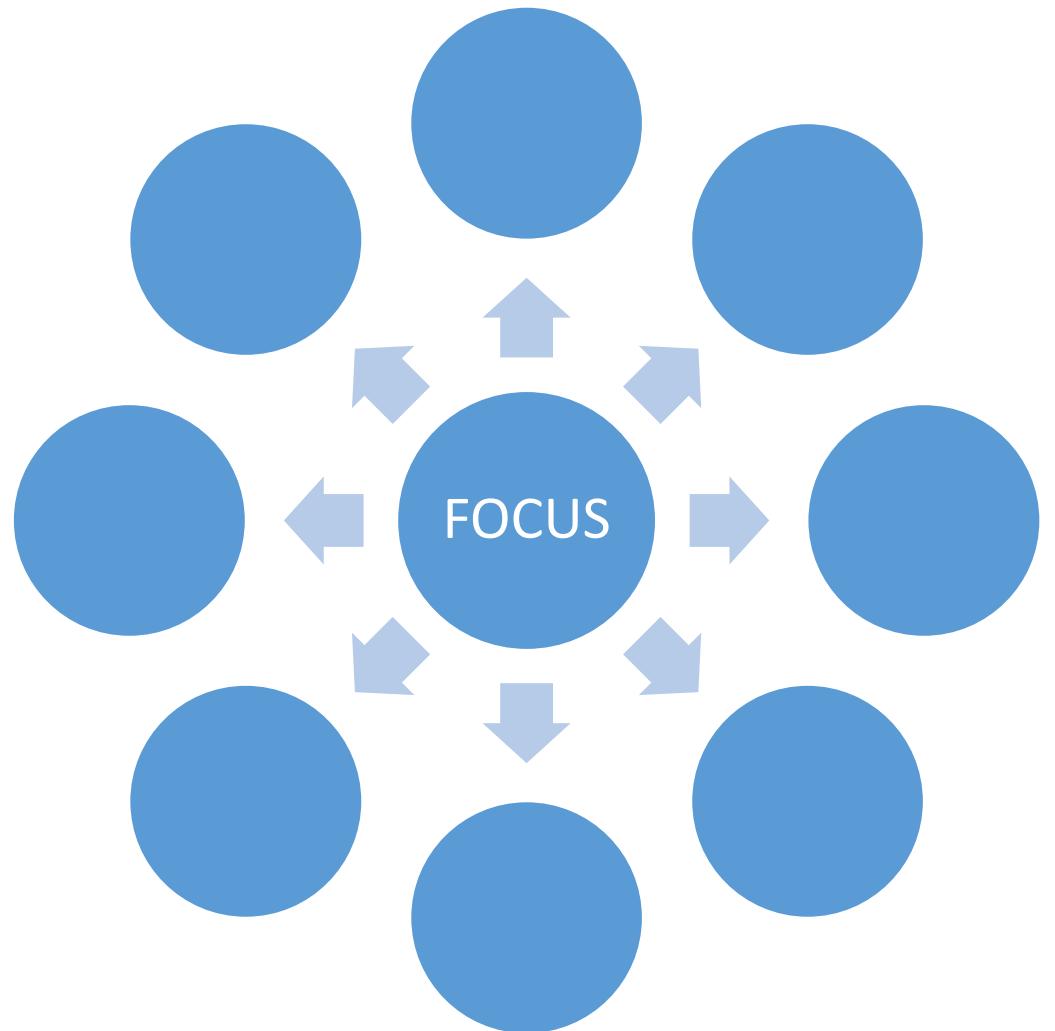
Name at least five of the ten statutory obligations of the Canadian privacy law PIPEDA (Personal Information Protection and Electronic Documents Act)



What are the five Fair Information Processing Principles recommended by the US Federal Trade Commission (FTC)?



Name at least four of eight additional FTC focus areas for fair information practices



Identify a global trend affecting information privacy and risk



List four principles that inform ethical behaviors online as context for online data

Ownership

Right to Be
Forgotten

Identity

Freedom
of Speech

Identify six unethical data handling practices or challenges

Misleading Visualizations

Unclear Definitions or Invalid Comparisons

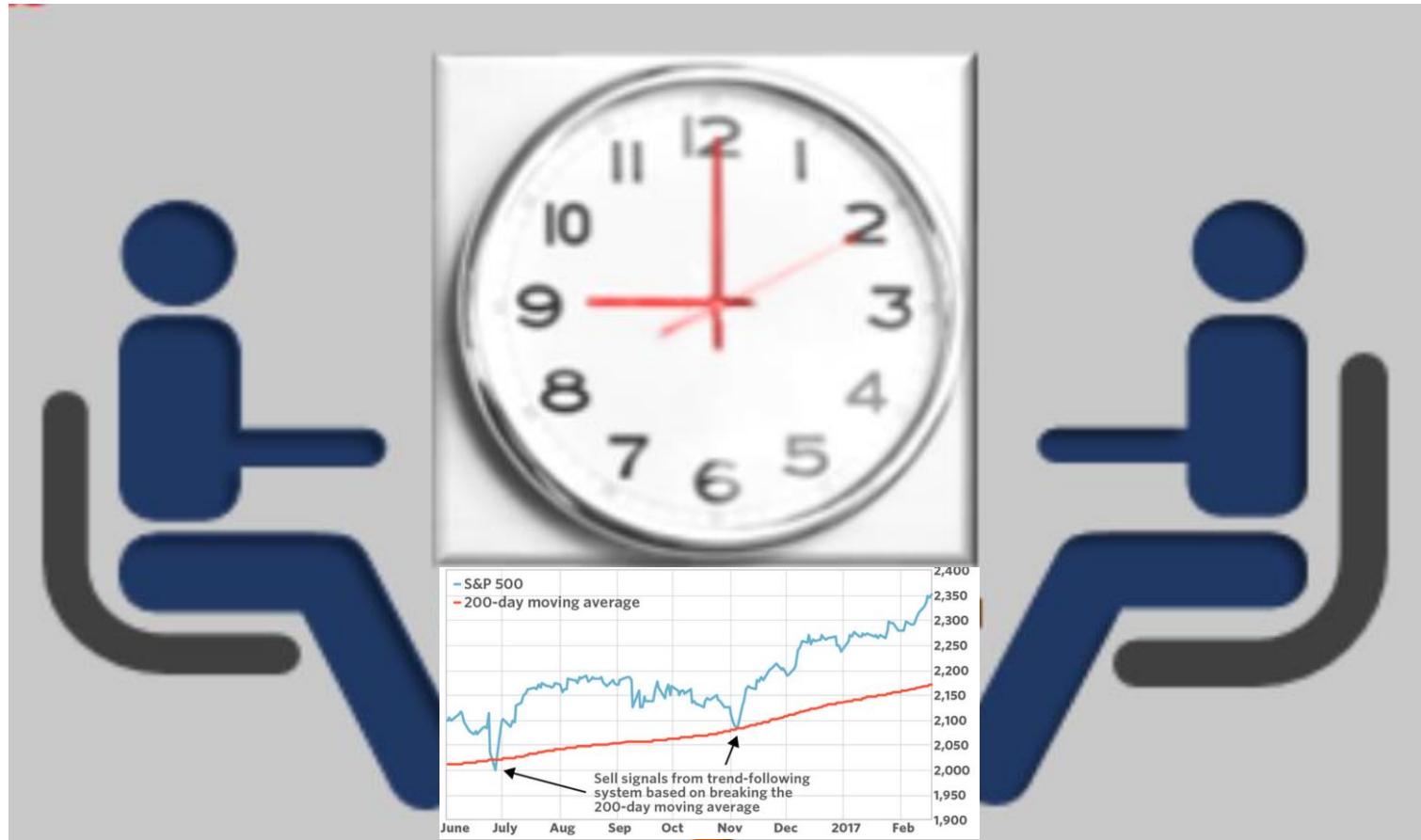
Bias

Transforming and Integrating Data

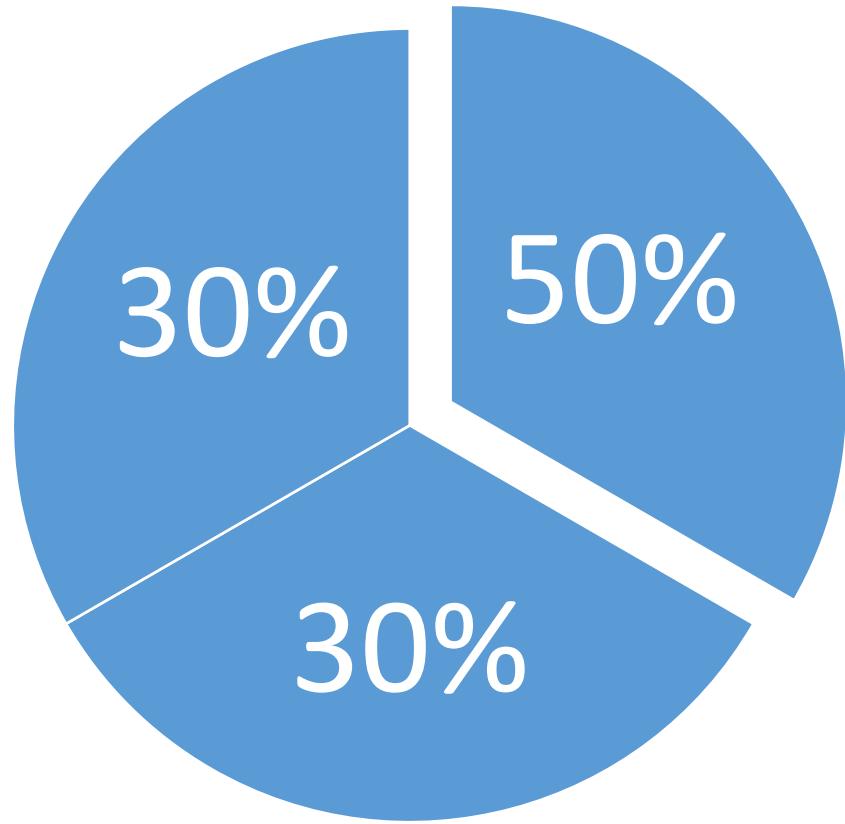
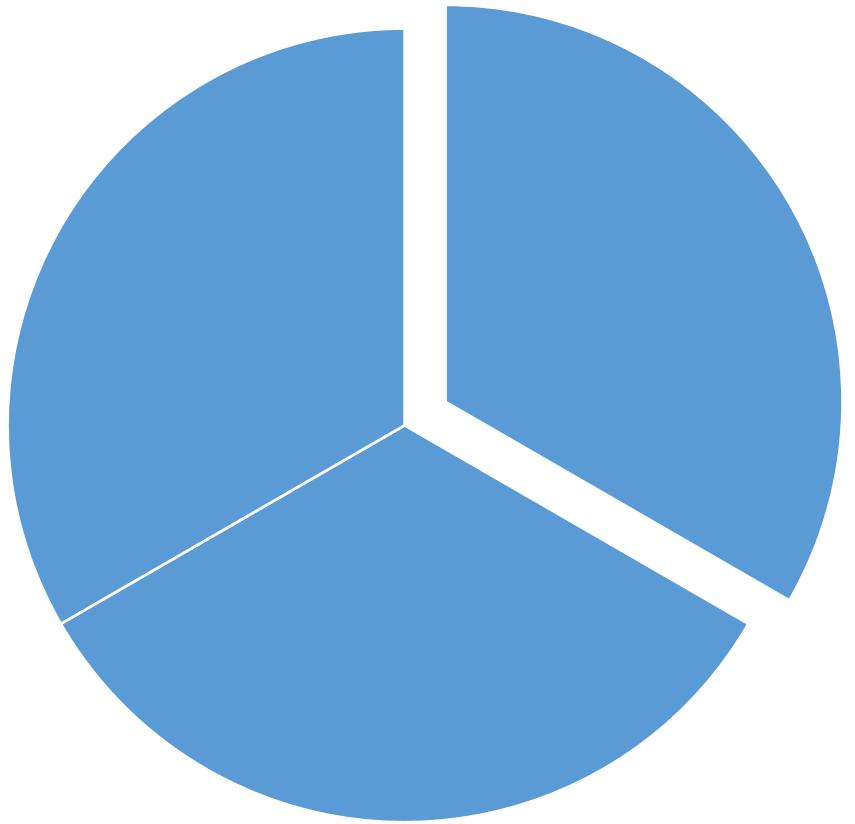
Obfuscation / Redaction of Data

Timing

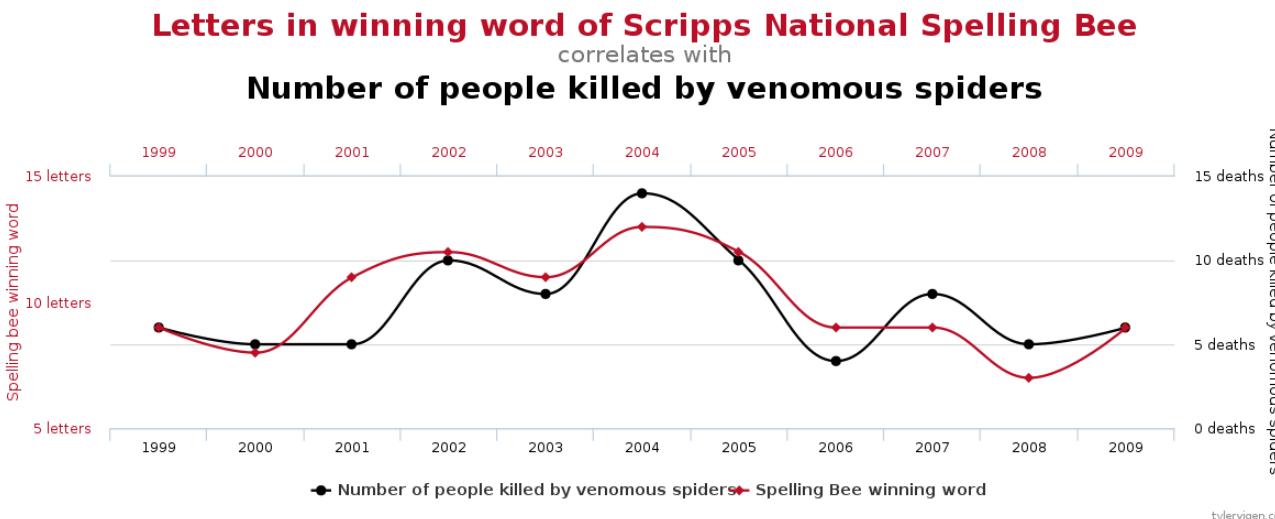
How does timing create risk of unethical data handling?



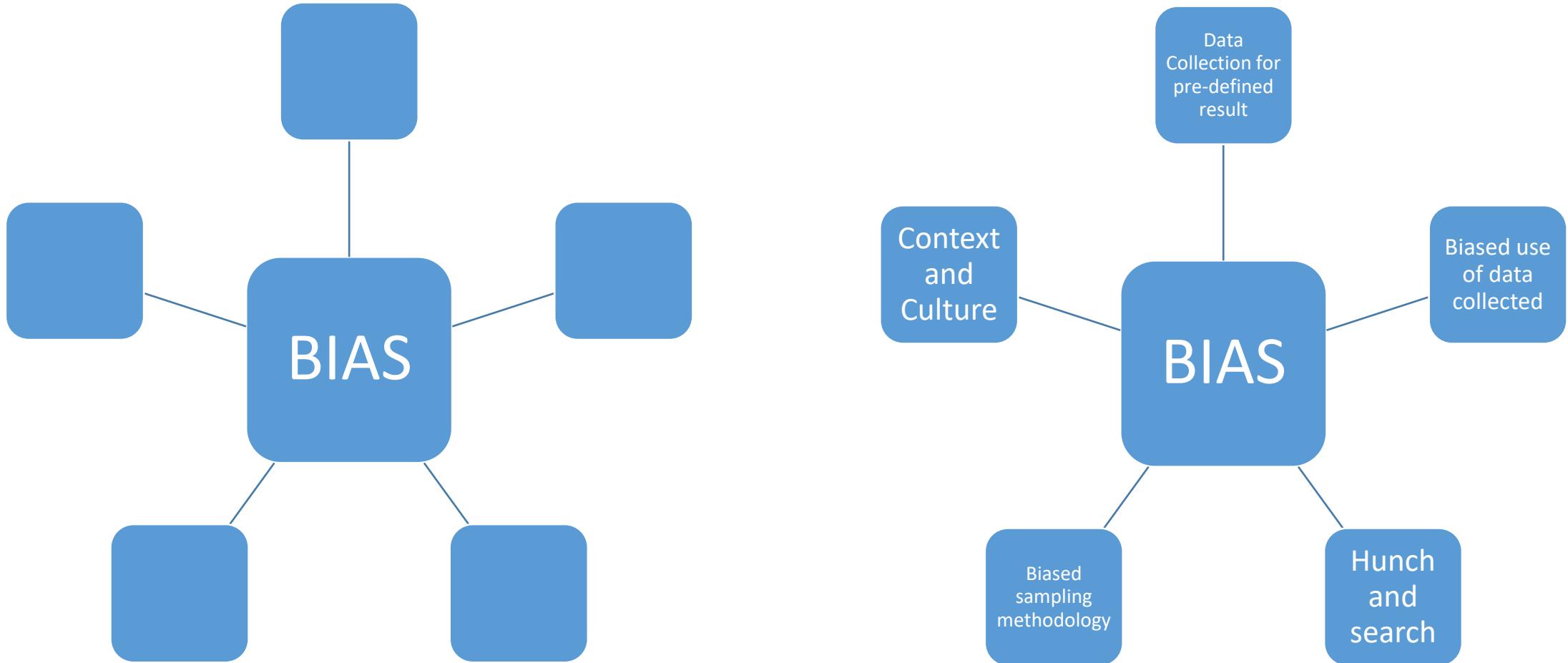
How do misleading visualizations create risk of unethical data handling?



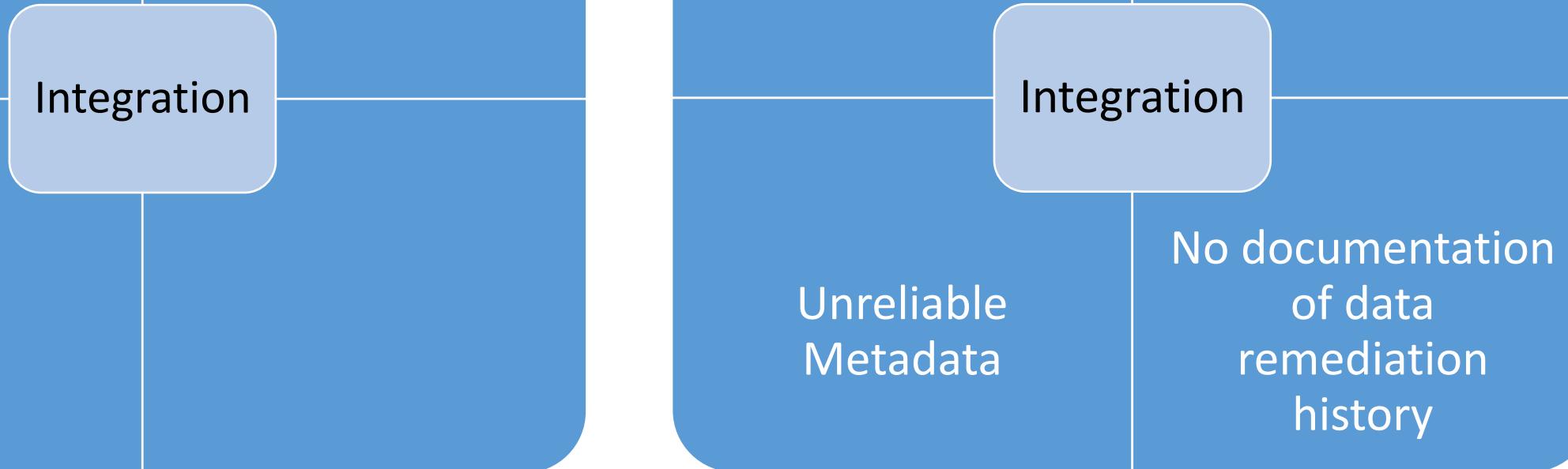
What are two ways that unclear definitions or invalid comparisons create risk of unethical data handling?



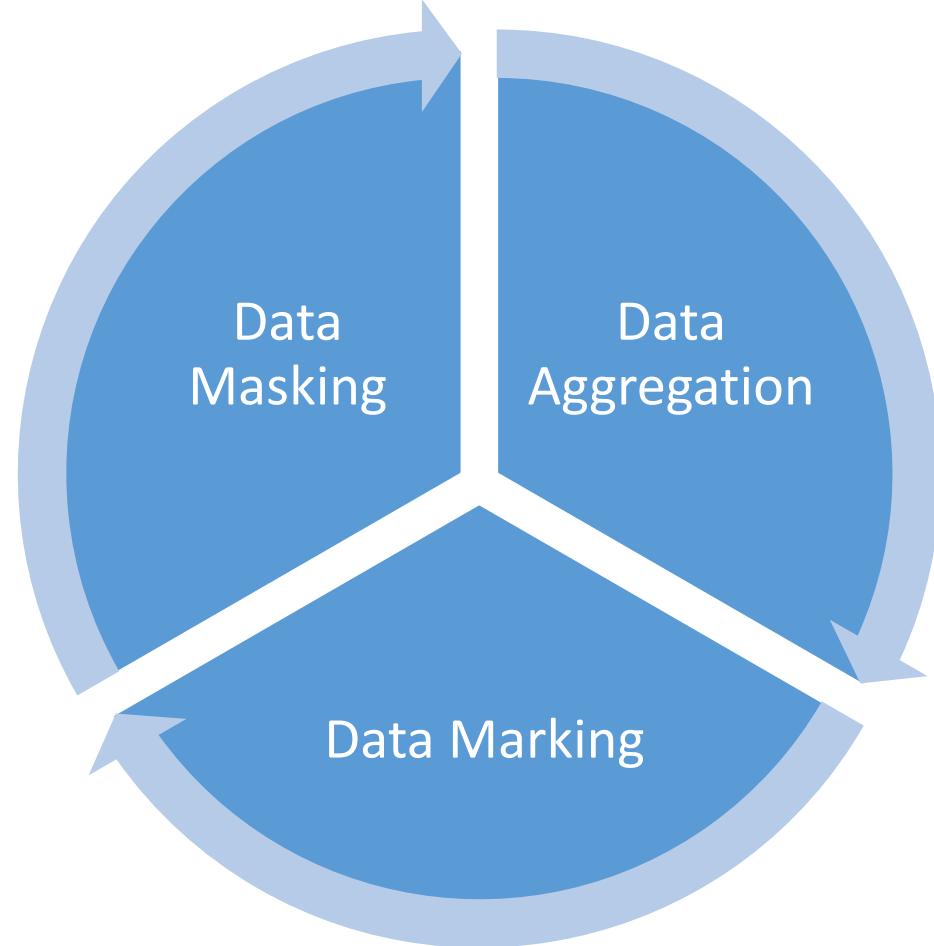
List at least three of five types of bias that create risk of unethical data handling



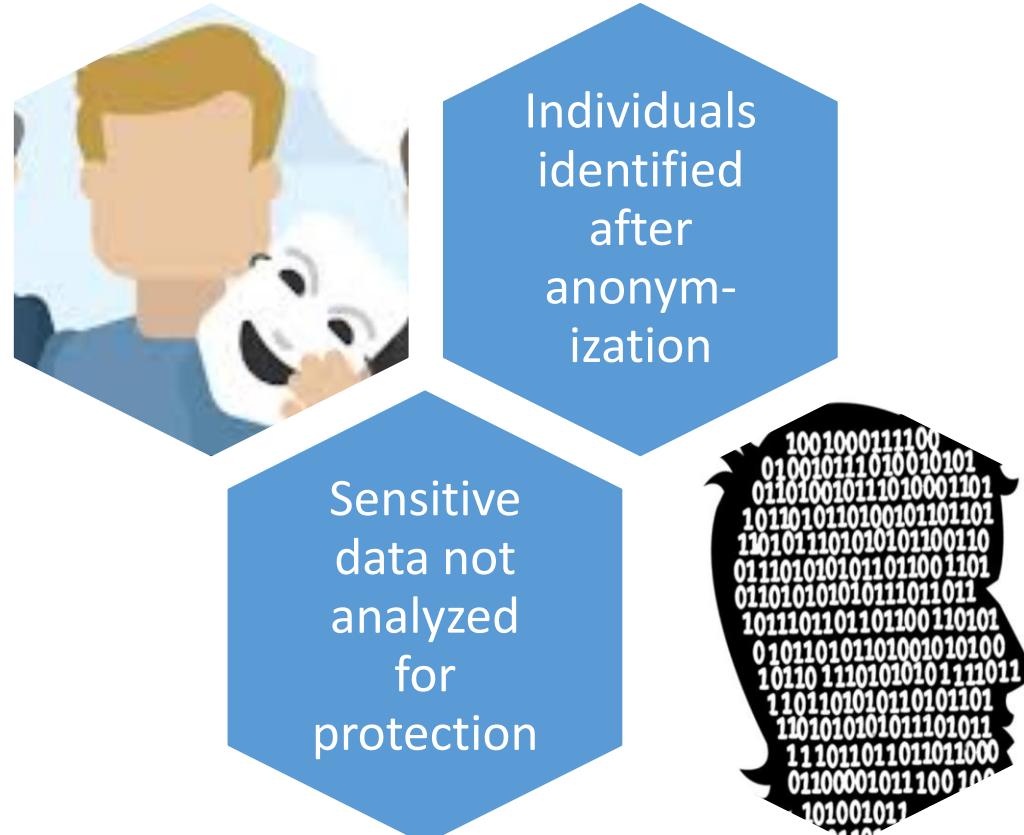
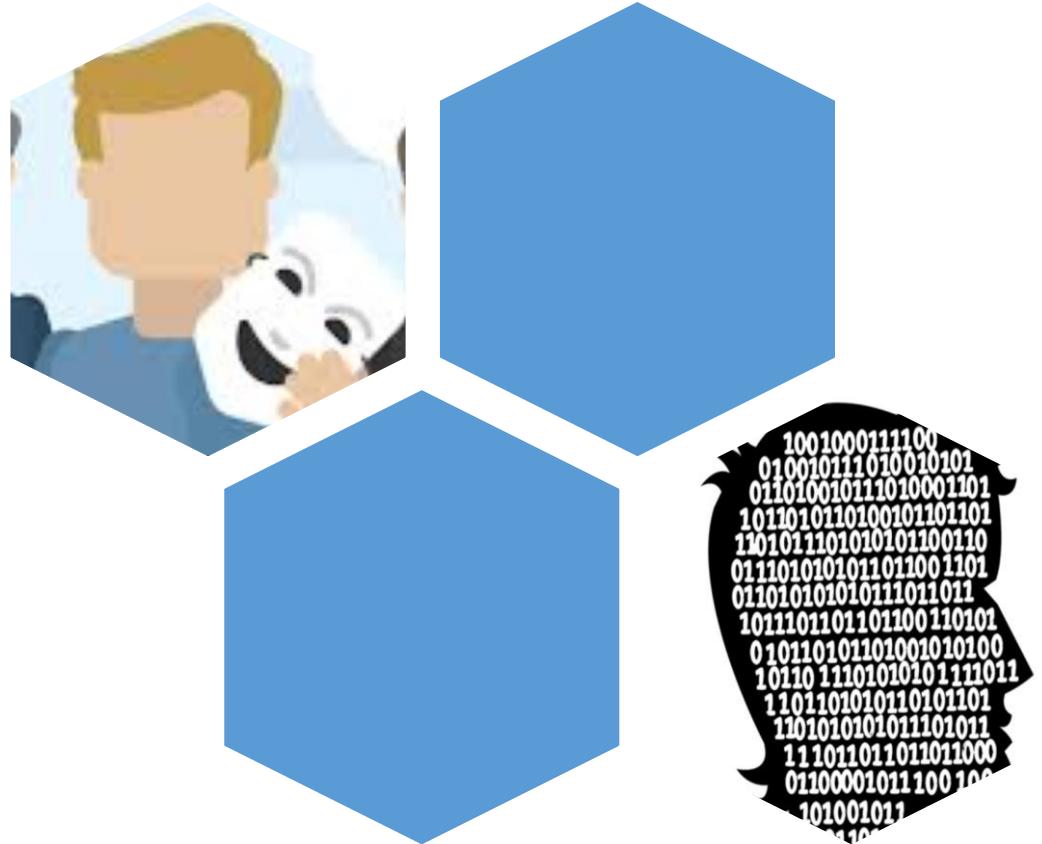
List four data integration practices that create risk of unethical data handling



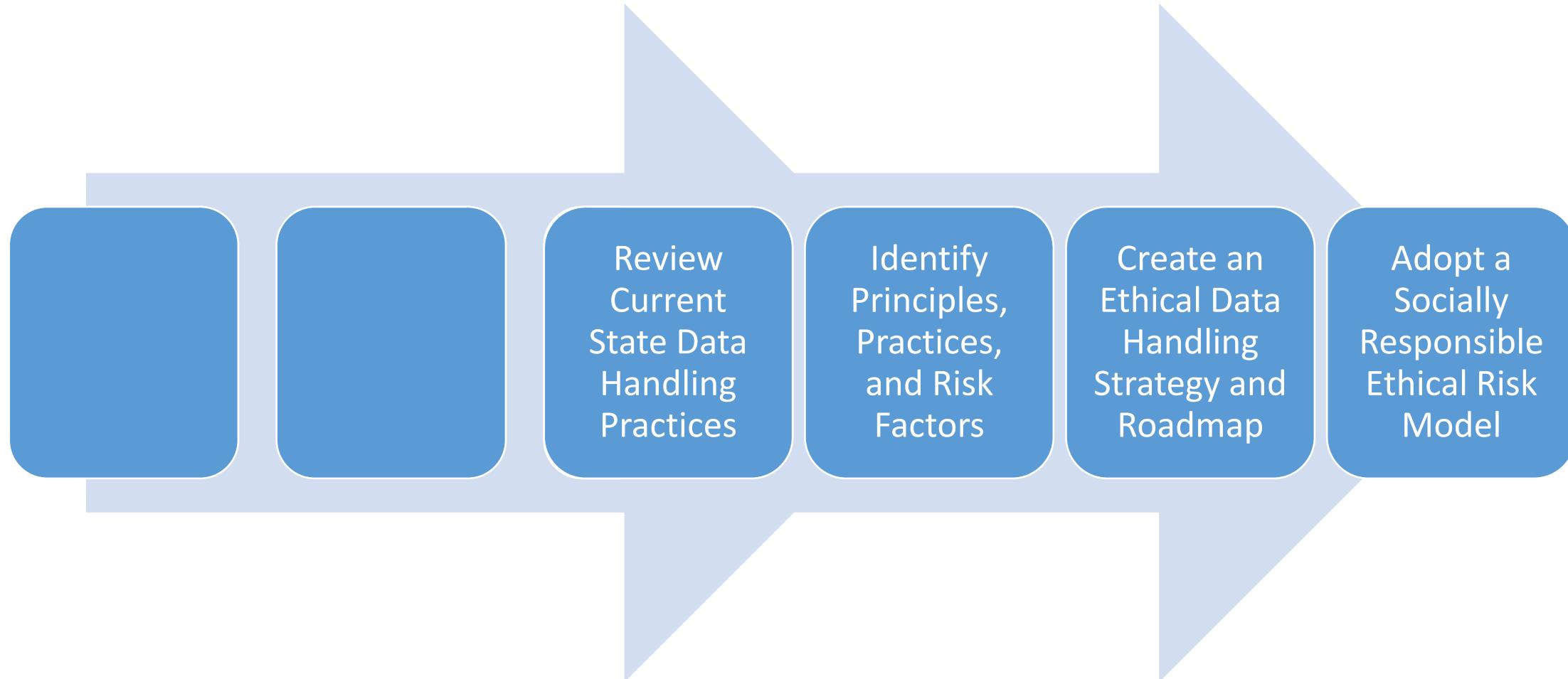
List three instances of data obfuscation / redaction practices that create risk of unethical data handling



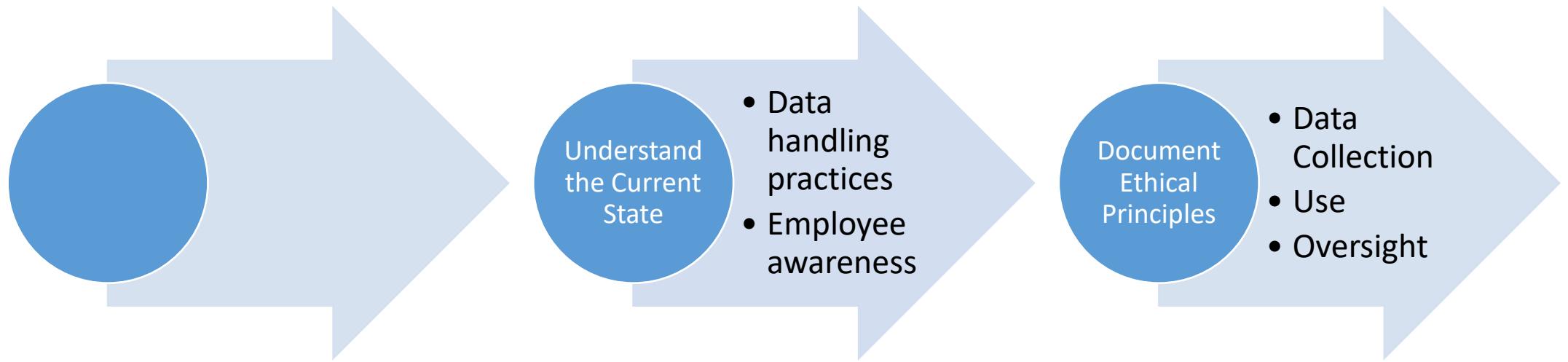
How do large data sets and data lakes raise practical data ethics concerns in data science and analytics?



Define a process that moves an organization toward establishing an ethical data culture



What is the first step toward establishing an ethical data culture and what are its outcomes?



Give an example of ethical data handling principle, risk, and practice supported by controls.

PRINCIPLE

-

PRINCIPLE

- Right to privacy about personal health info (PHI) = accessible only to caregivers

RISK

-

RISK

- Public access to PHI could jeopardize privacy

PRACTICE

-

PRACTICE

- Only nurses/doctors may access PHI for providing care

CONTROL

-

CONTROL

- Annual user review of PHI systems

Give at least four of seven components of an ethical data handling strategy.



Values statements

Ethical Data Handling Principles

Compliance Framework

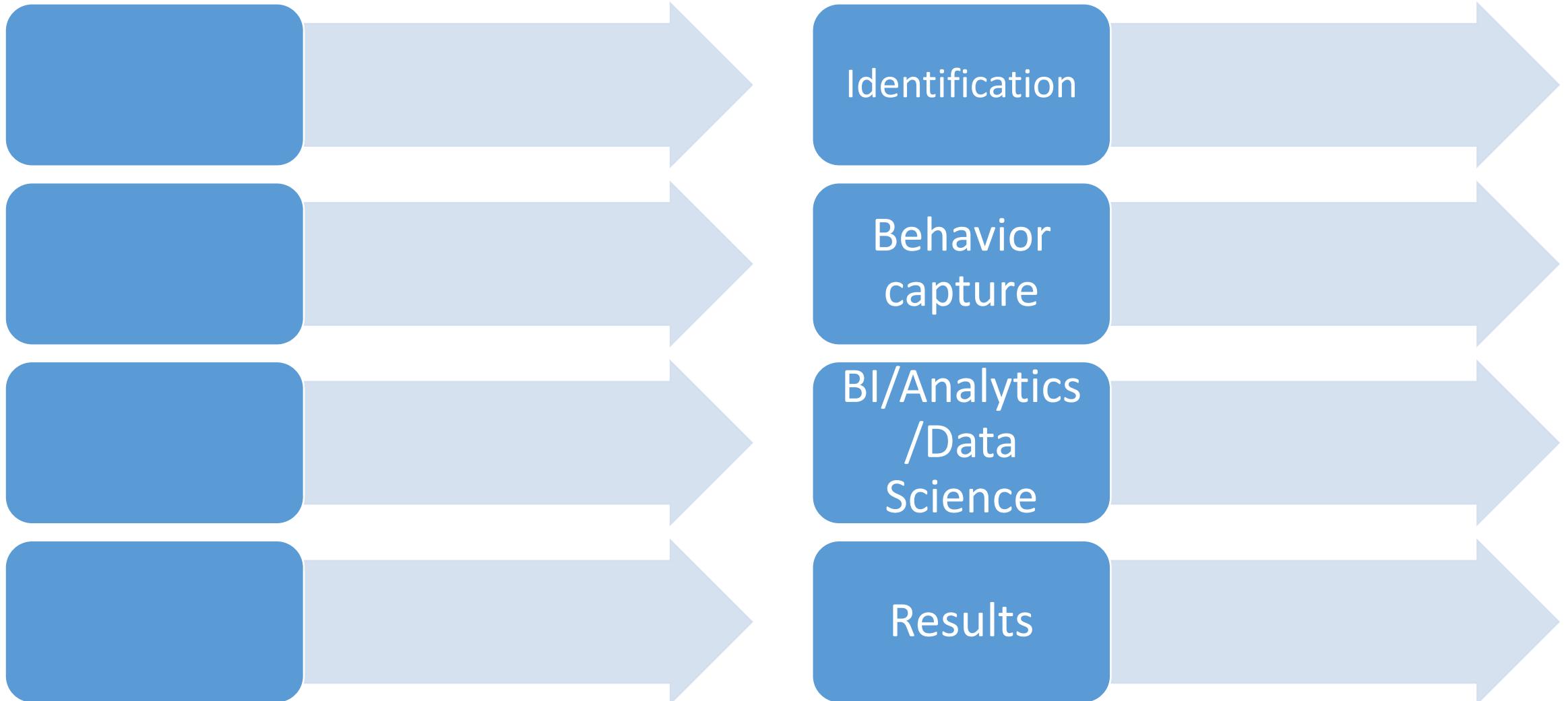
Risk Assessments

Training and Communications

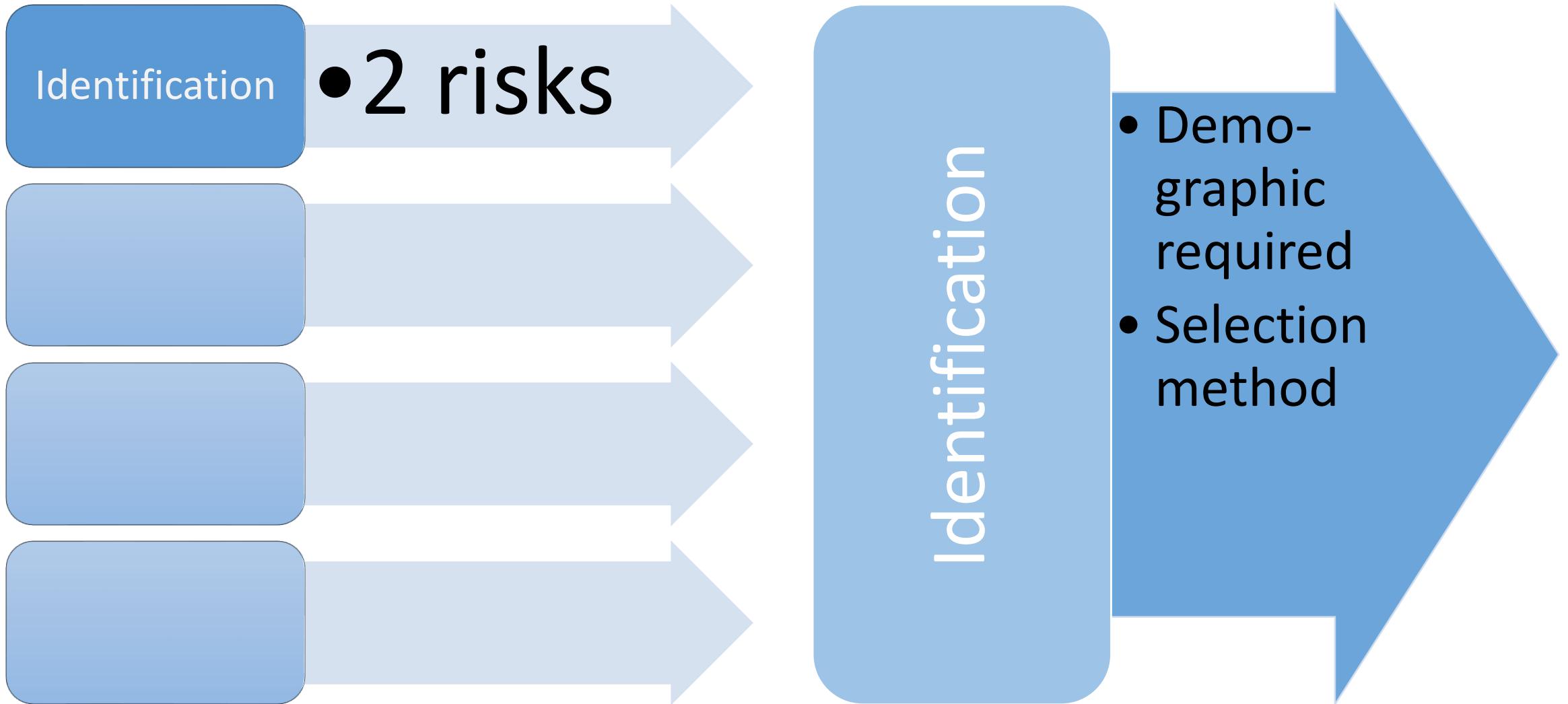
Roadmap

Auditing and Monitoring

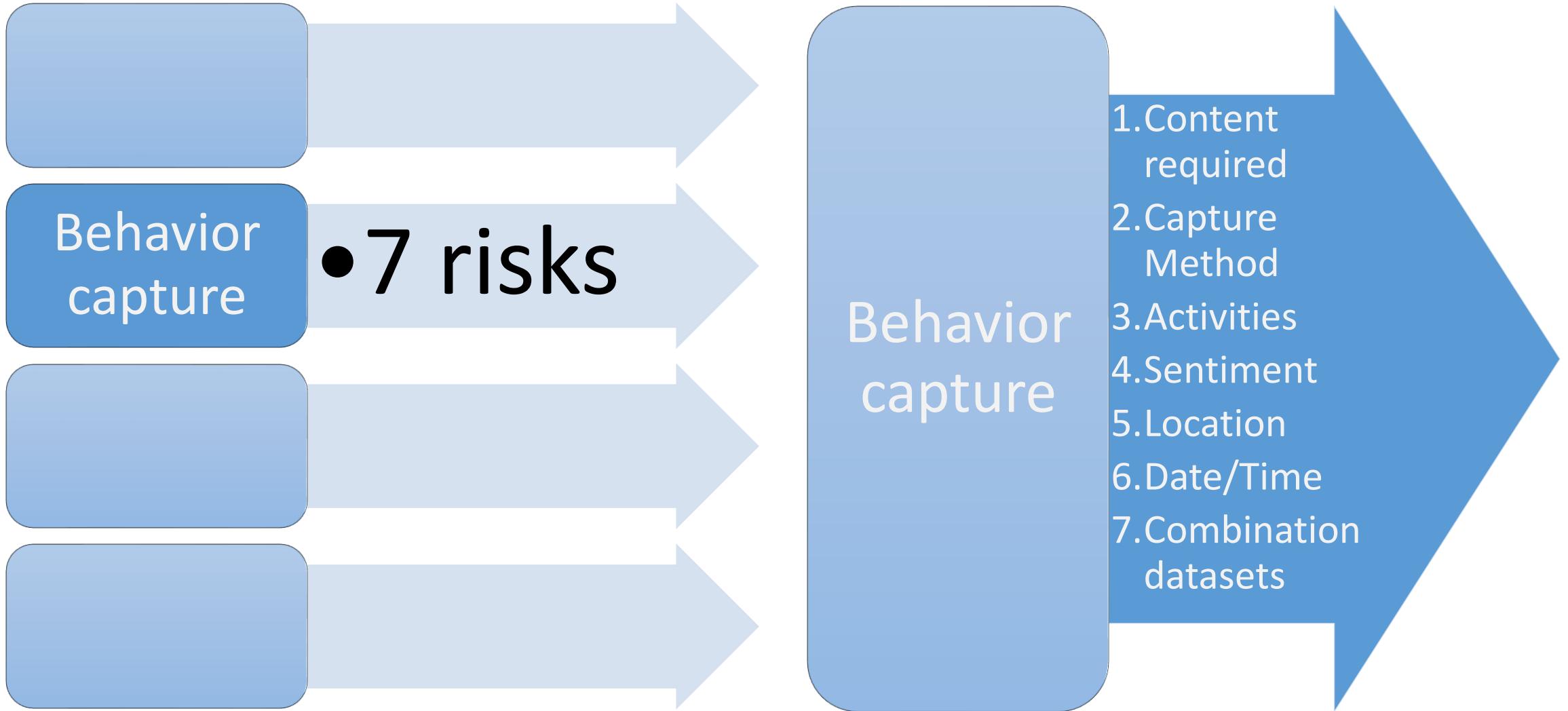
List and define four risk areas of an ethical data sampling project that uses personal data



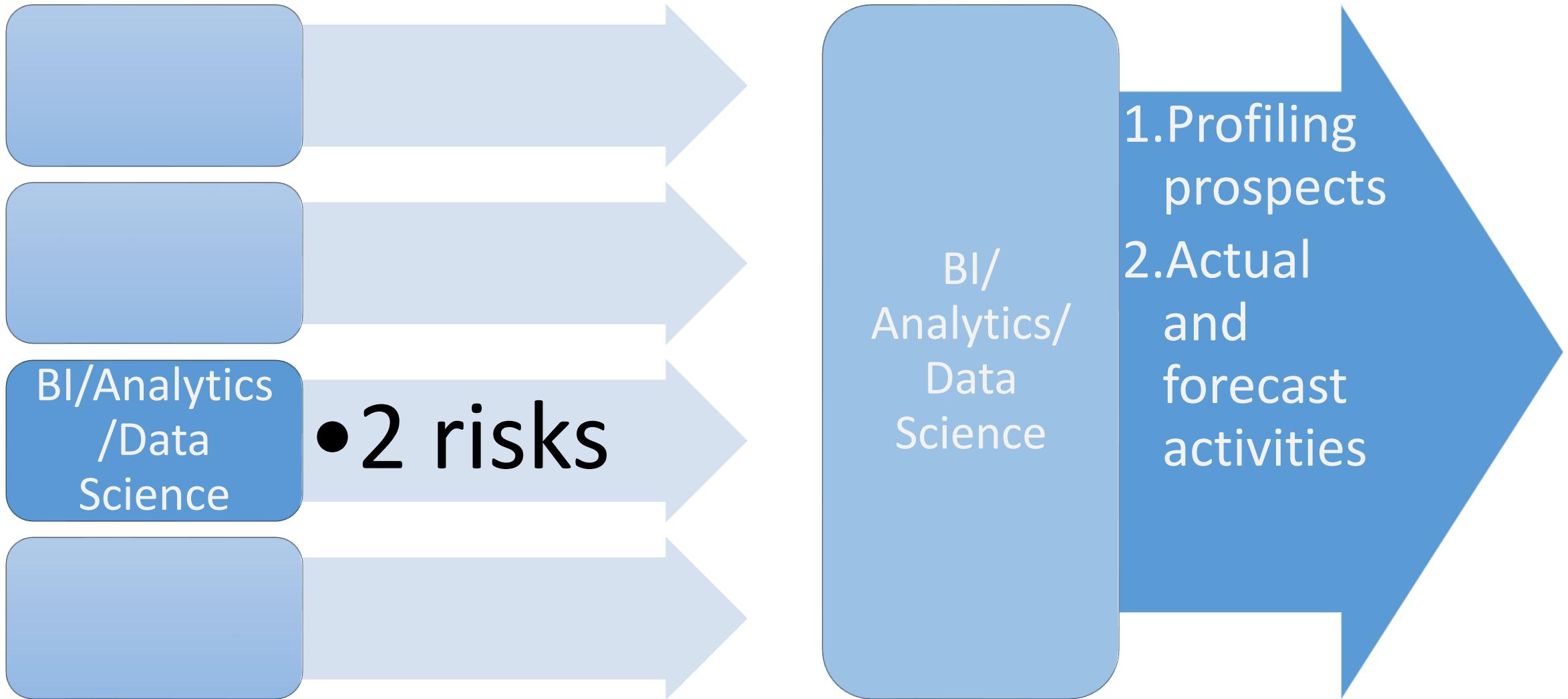
What ethical risks of the **identification** of a population for data science analysis may require ethical and legal review?



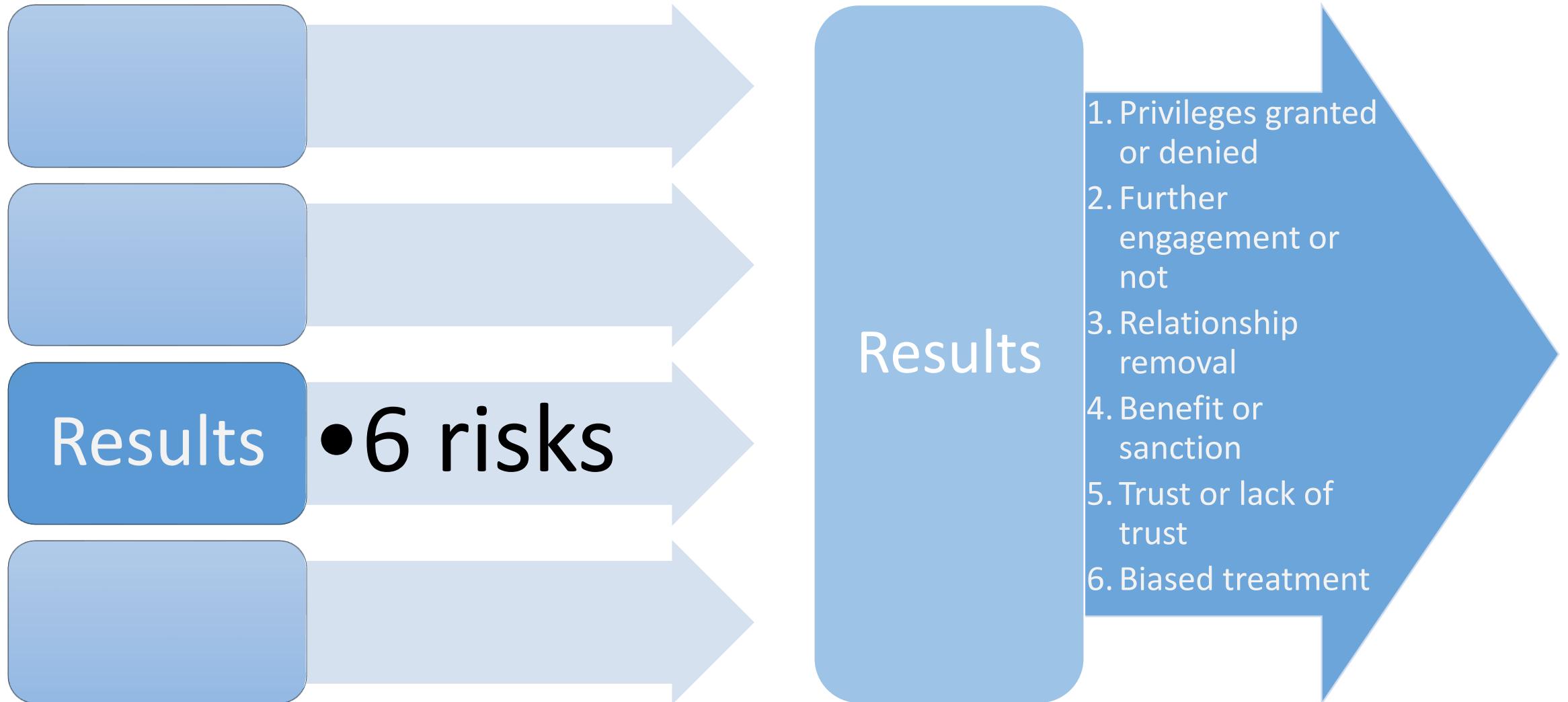
What ethical risks of **behavior capture** for data science analysis may require ethical and legal review?



What ethical risks of BI/Data Science/Analytics may require ethical and legal review?



What ethical risks of distributing the **results** of data science analysis may require ethical and legal review?



Give at least two of four examples of how to use a risk model to execute a data handling project ethically

Risk Model



1

2

3

4

Risk Model



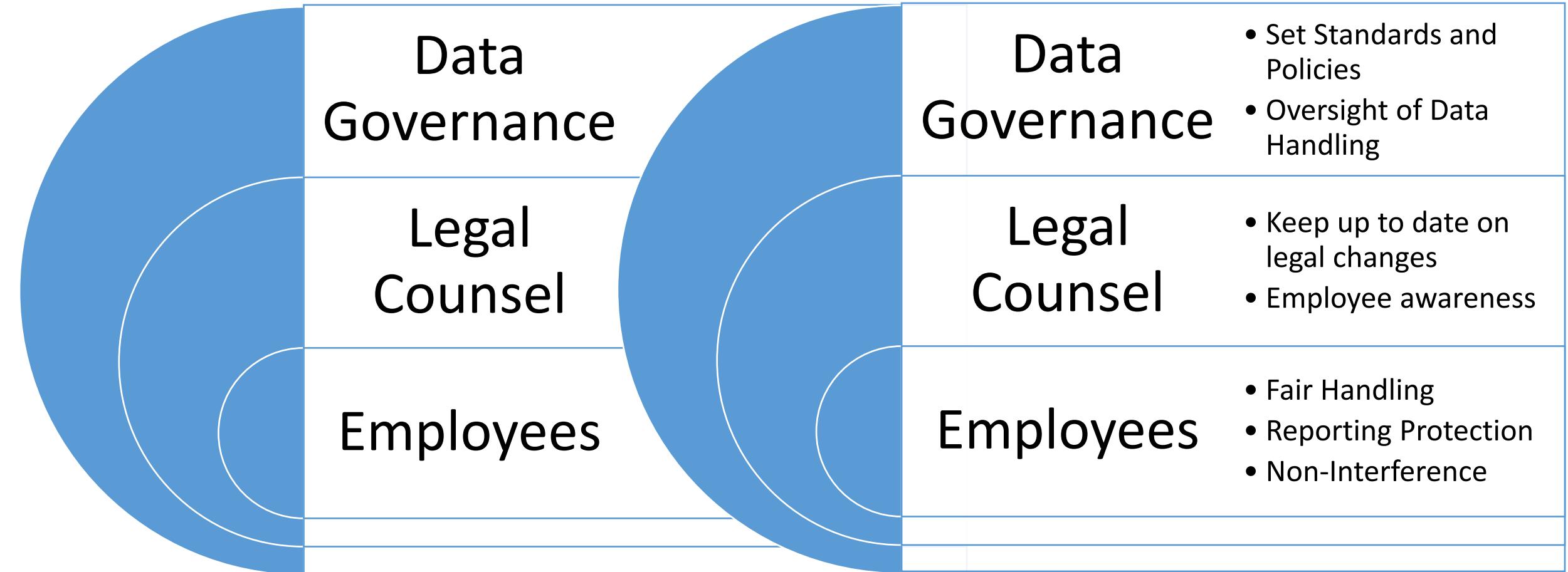
Anonymize data

Remove private information

Tighten security

Review applicable privacy law

What are the roles and responsibilities for oversight of ethical data handling?



Give at least three of five ethical obligations for members of DAMA as included in the DAMA Code of Ethics.



Observe DAMA bylaws



Practice DAMA ethics and values



Education and lifelong learning in data management



No harassment or bullying



Promote DAMA's image

Give at least three of six additional ethical obligations for officers and advisors of DAMA as included in the DAMA Code of Ethics.



Actively support DAMA programs

Not profit personally from my performance as an officer

Raise conflicts of interest to the DAMA Ethics Officer

Conduct all DAMA business under its values and ethics

All DAMA communications are official and on the record

Protect member PII and do not distribute or sell it

Q & A



Part 3: Data Governance

AGENDA

- Facilitator
- Introductory Note
- Chapter 3: Data Governance
 - Overview
 - Jeopardy!
- Q & A
- Next Session

Chapter 3: Data Governance

Data Governance provides direction and oversight for data management activities and functions by establishing a system of decision rights and responsibilities for data. These rights and responsibilities should account for the needs of the enterprise as a whole.

Data Governance is at the heart of managing data assets. Its scope includes:

- Strategy
- Policy
- Standards and Quality
- Oversight
- Compliance
- Issue Management
- Data Management Projects
- Data Asset Valuation



Data Governance Introduction

Definition: The exercise of authority, control, and shared decision-making (planning, monitoring, and enforcement) over the management of data assets.

Goals:

1. To enable an organization to manage its data as an asset
2. To define, approve, communicate, and implement principles, policies, procedures, metrics, tools, and responsibilities for data management
3. To monitor and guide policy compliance, data usage, and management activities

Guides all other data management functions

Best managed as an on-going program and continuous improvement process

Data Governance Business Drivers

Regulatory compliance



Explosion in advanced analytics and data science

Reducing risks:

- General risk management (e.g. reputational risk, financial risk)
- Data security
- Privacy



Improving processes:

- Data quality improvements
- Metadata management
- Efficiency in the SDLC (Systems development lifecycle)
- Vendor management



Data Governance Goals and Principles

Overall Goal: Sustainable, Embedded, Measured

The following principles can help to set a strong foundation:

- Leadership and strategy
- Business-driven
- Shared responsibility (e.g. business, IT, analytics, business intelligence)
- Multi-layered (e.g. enterprise-wide, divisional, and local)
- Framework-based
- Principle-based

Data Governance Operating Model Types

Centralized:

- Data Governance Organization oversees all activities in all subject areas

Replicated:

- The same Data Governance operating model is adopted in each business unit

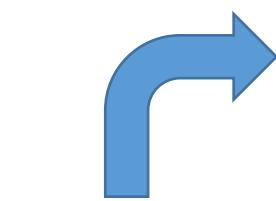
Federated:

- One Data Governance organization coordinates with multiple business units to maintain consistent definitions and standards

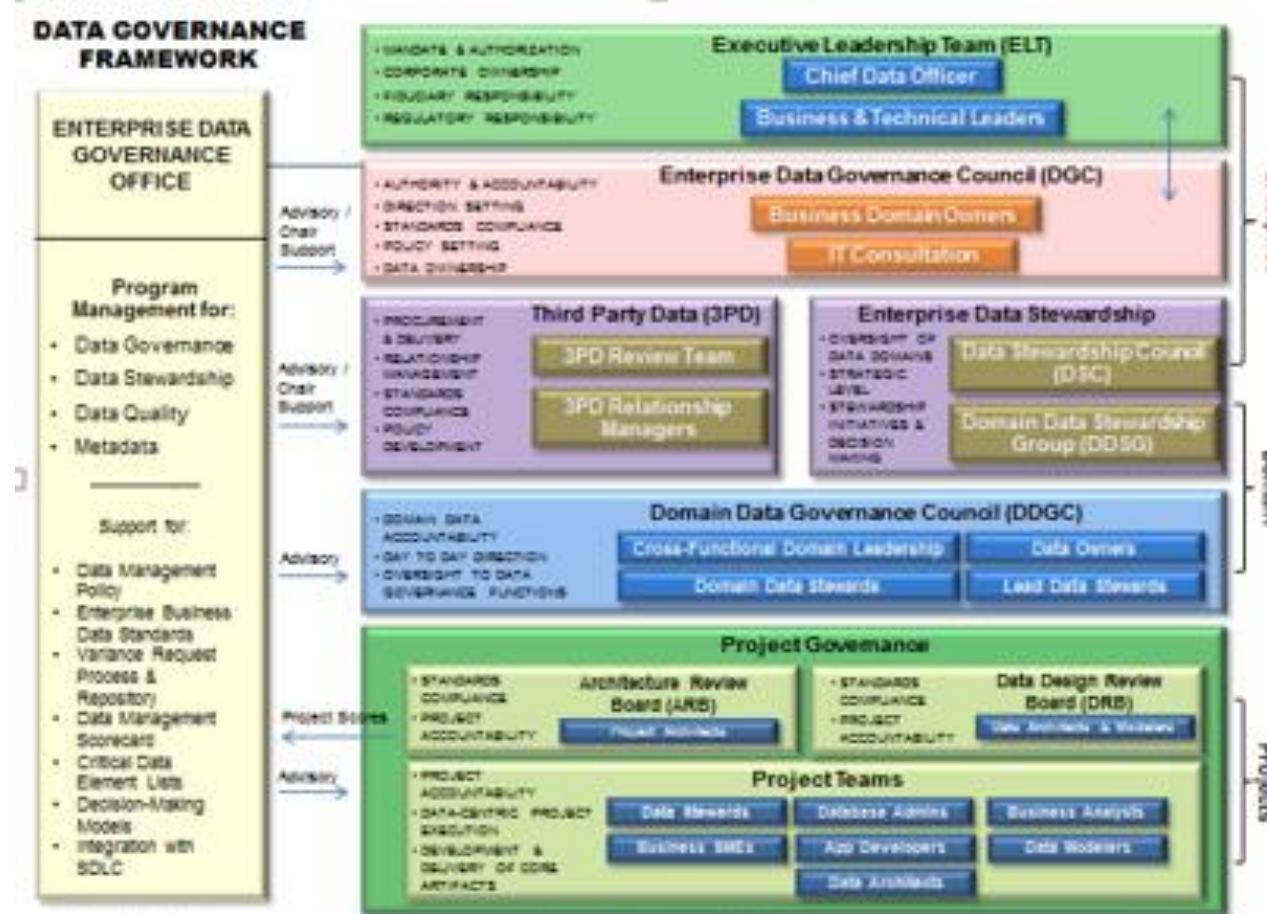
See page 75 in DMBOK2 for pictures of each

Data Governance Organization

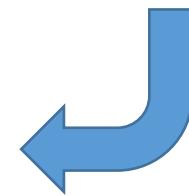
Sample Data Governance Organization



Oversight



Execution



This is an example of a federated model

Data Stewardship

The accountability and responsibility for data and processes that ensure effective control and use of data assets

Synonyms:

- Custodian
 - Trustee
 - Domain expert

Activities:

- Creating and managing core metadata
 - Documenting rules and standards
 - Managing Data Quality issues
 - Executing operating Data Governance activities

Types:

- Chief Data Stewards
 - Executive Data Stewards
 - Enterprise Data Stewards
 - Business Data Stewards
 - Data Owner
 - Technical Data Stewards
 - Coordinating Data Stewards

The best Data
Stewards are
often found not
“made” but can
be “made” and
trained



Data Policies

Describe the “what” (i.e. **what to do and what not to do**)

Example policies
are on page 84 of
the DMBOK2

Document expected behaviors related to data management and use

Should be **relatively few** data policies

Should be **brief and direct**

Are **global**

Support Data Standards

Must be **effectively communicated, monitored, enforced, and periodically re-evaluated**



Data Asset Valuation

The process of understanding and calculating the economic value of data

Generally Accepted Information Principles:

(much like Generally Accepted Accounting Principles)

- **Accountability:** Who's accountable
- **Asset:** Data is an asset and should be managed like other assets
- **Audit:** Accuracy of data is subject to audit
- **Due Diligence:** Report and confirm risks, if known
- **Going Concern:** Data is critical to ongoing business success
- **Level of Valuation:** Value the asset to the degree that makes sense
- **Liability:** Financial liability if misused or mismanaged
- **Quality:** Quality of data can affect the business financial status
- **Risk:** Risk of data must be recognized and managed
- **Value:** Value of data reflects its contribution to an organization offset by the cost of maintenance and movement

Ways to measure value:

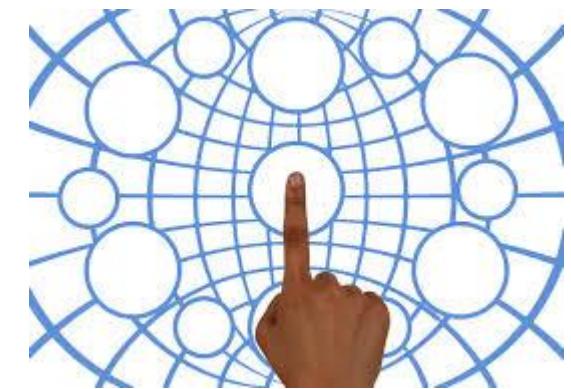
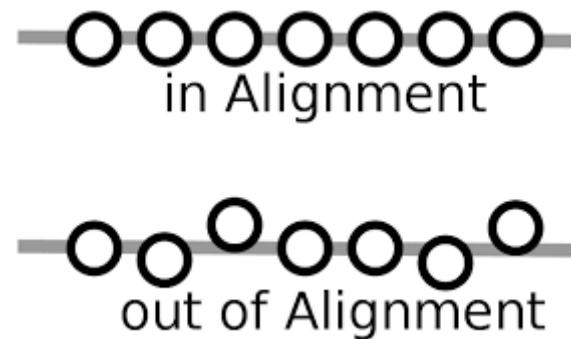
- Replacement cost
- Market value
- Identified opportunities
- Selling data
- Risk cost



Data Governance Activities

Define Data Governance for the Organization (Planning):

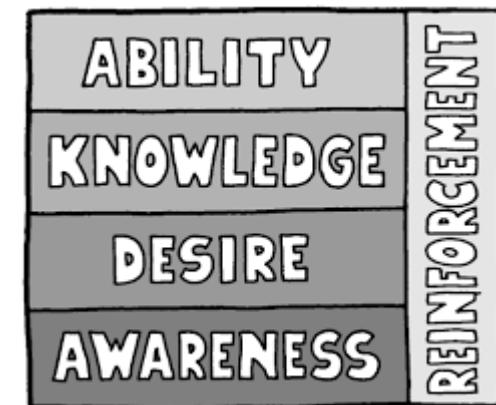
- Perform Readiness Assessment
- Perform Discovery and Business Alignment
- Develop Organizational Touchpoints



Data Governance Activities

Define the Data Governance Strategy (Planning):

- Define the Data Governance Operating Framework
- Develop Goals, Principles, and Policies
- Underwrite Data Management projects
- Engage Change Management
- Engage in Issue Management
- Assess Regulatory Compliance Requirements



Data Governance Activities

Implement Data Governance (Operations):

- Sponsor data standards and procedures
- Develop a business glossary
- Coordinate with architecture groups
- Sponsor data asset evaluation



Embed Data Governance (Control and Operations):

- Outline activities, timing, and techniques to sustain success
- Data Governance Community of Interest

Data Governance Tools and Techniques

Data Governance is fundamentally about organizational behavior. This is not a problem that can be solved through technology; however, there are tools that support the overall process.

Define the overall Data Governance goals and requirements with an eye for building out a tool set and consider the following:

- Online presence / Websites
- Business Glossary – A CORE data governance tool
- Workflow tools
- Document Management tools
- Data Governance Scorecards

Data Governance Implementation Guidelines

Most roll-out strategies are incremental and rarely deployed enterprise-wide as a first effort

Organization and Culture

- Data Governance must be aligned to business goals and strategy
- You must consider your organization's readiness and culture and help them adapt to the change
- Ignoring culture will diminish chances for success
- Data Governance brings value by bringing about changes in behavior
- Sustaining a Data Governance program requires planning for change

Adjustment and Communication

Tools needed to manage and communicate these behavioral changes:

- Business / DG strategy map
- DG roadmap
- Ongoing business case for DG
- DG metrics



Data Governance Metrics

To counter resistance or the challenge of a long learning curve, the DG program must be able to measure progress and success and how participants have added business value and achieved objectives.

Sample metrics include:

Value

- Contributions to business objectives
- Reduction of risk
- Improved efficiency in operations

Sustainability:

- Performance of policies and processes
- Conformance to standards and procedures

Efficiency

- Achievement of goals and objectives
- Extent tools are using the relevant tools
- Effectiveness of communications
- Effectiveness of education/training



Data Governance Jeopardy!

| Basics | Roles | Activities | Culture | Deliverables |
|--------------|--------------|--------------|--------------|--------------|
| <u>\$100</u> | <u>\$100</u> | <u>\$100</u> | <u>\$100</u> | <u>\$100</u> |
| <u>\$200</u> | <u>\$200</u> | <u>\$200</u> | <u>\$200</u> | <u>\$200</u> |
| <u>\$300</u> | <u>\$300</u> | <u>\$300</u> | <u>\$300</u> | <u>\$300</u> |
| <u>\$400</u> | <u>\$400</u> | <u>\$400</u> | <u>\$400</u> | <u>\$400</u> |
| <u>\$500</u> | <u>\$500</u> | <u>\$500</u> | <u>\$500</u> | <u>\$500</u> |

Data Governance Jeopardy – Basics \$100

Answer:

The exercise of authority and control (planning, monitoring, and enforcement) over the management of data assets is referred to as this.

Question:

What is Data Governance? (pg 67)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Basics \$200

Answer:

To benefit from data as a corporate asset, the organizational _____ must learn to value data and data management activities.

Question:

What is culture? (pg 68)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Basics \$300

Answer:

The most common driver for Data Governance.

Question:

What Regulatory Compliance (pgs 70 and 87)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Basics \$400

Answer:

Data Governance represents an inherent separation of duties between _____ and _____.

Question:

What are oversight and execution? (pg 72)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Basics \$500

Answer:

These 6 components of data governance must be defined, approved, communicated, and implemented.

Question:

What are principles, policies, procedures, metrics, tools, and responsibilities? (pg 69)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Roles \$100

Answer:

The primary and highest authority organization for Data Governance responsible for oversight, support, and funding of data governance activities.

Question:

What is the Data Governance Steering Committee? (pg 76)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Roles \$200

Answer:

The 3 layers/levels in which Data Governance organizations may address concerns within an enterprise.

Question:

What enterprise-wide, divisional, and local? (pg 73)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Roles \$300

Answer:

This role has the formal accountability and responsibility for data and processes that ensure effective control and use of data assets. They manage data assets on behalf of others and in the best interests of the organization. They are appointed to represent the data interests of all stakeholders, including but not limited to, the interests of their own functional departments and divisions. They must take an enterprise perspective to ensure the quality and effective use of enterprise data.

Question:

What is the Data Steward? (pgs 75- 76)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Roles \$400

Answer:

This group manages Data Governance initiatives (e.g. development of policies or metrics), issues, and escalations. It is typically comprised of representatives from various divisions or subject areas.

Question:

What is the Data Governance Council? (pg 74)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Roles \$500

Answer:

Data Stewards may be differentiated by their place in the organization, by the focus of their work, or by both. Three examples of types of Data Stewards include:

Question:

What are Chief Data Steward, Executive Data Steward, Enterprise Data Steward, Business Data Steward, Technical Data Steward, Coordinating Data Steward, and Data Owner?

(pg 77)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Activities \$100

Answer:

The result of this activity will include these components:

- Charter
- Operating framework and accountabilities
- Implementation roadmap
- Plan for operational success.

Question:

What is a Developing a Data Governance Strategy? (pg 82)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Activities \$200

Answer:

This activity accounts for the interaction between the data governance organization and the people responsible for data management projects or initiatives, the engagement of change management activities, and the model for issue management resolution.

Question:

What is Defining the Data Governance Operating Framework? (pg 82)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Activities \$300

Answer:

This activity guides the organization into the desired future state.

Question:

What is developing goals, principles, and policies? (pg 83)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Activities \$400

Answer:

This activity usually requires cross-functional sponsorship, can be a hard sell, and offers enterprise-wide benefits.

Question:

What is Underwrite Data Management Projects? (pg 84)

NOTE: Every project should capture data management requirements early in the SDLC!

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Activities \$500

Answer:

This activity should promote consistent results and could influence quality in other Data Management knowledge areas:

Question:

What is development of Data Standards and Procedures? (pg 88)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Culture \$100

Answer:

This is most often a key factor in the success of a Data Governance Program.

Question:

What is strong, committed, and visionary leadership? (pgs 68 and 72)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Culture \$200

Answer:

Implementing Data Governance requires commitment to this and is often formally managed to ensure awareness, desire, knowledge, ability, and reinforcement.

Question:

What is change / change management? (pgs 71, 85-86)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy –Culture \$300

Answer:

Data Governance brings value to an organization by bringing about changes in this.

Question:

What is behavior? (pg 93)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Culture \$400

Answer:

Ignoring culture will diminish chances for this.

Question:

What is success? (pg 93)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Culture \$500

Answer:

The aspect of the data governance program that requires planning for change and measures how easy it is to continue to add value.

Question:

What is sustainability? (pg 94)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Deliverables \$100

Answer:

This core Data Governance tool/deliverable houses agreed-upon definitions of business terms and relates these to data.

Question:

What is a Business Glossary? (pg 92)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Deliverables \$200

Answer:

These cover topics such as naming, assertions about how a field must be populated, and detailed documentation of acceptable and unacceptable values and formats.

They can influence each data management knowledge area. They are usually drafted by data management professionals. They should be reviewed, approved and adopted by the Data Governance Council. They must be effectively communicated, monitored, enforced, and periodically re-evaluated.

Question:

What are Data Standards and Procedures? (pg 89)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Deliverables \$300

Answer:

These help the Data Management Executive, the Data Governance Council, and others track progress and performance of the data governance function.

Question:

What are Metrics and Scorecards? (pgs 93-94)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Deliverables \$400

Answer:

This deliverable can house documentation libraries, give access to search capabilities, help manage simple workflow, establish a brand for the program through logos and a consistent visual representation.

Question:

What is a Data Governance website? (pg 92)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Data Governance Jeopardy – Deliverables \$500

Answer:

A key driver of Data Governance and a measure of its success.

Question:

What is recognized data value? (pgs 67 and 69)

| Basics | Concepts | Activities | Org and Culture | Deliverables |
|--------|----------|------------|-----------------|--------------|
| \$100 | \$100 | \$100 | \$100 | \$100 |
| \$200 | \$200 | \$200 | \$200 | \$200 |
| \$300 | \$300 | \$300 | \$300 | \$300 |
| \$400 | \$400 | \$400 | \$400 | \$400 |
| \$500 | \$500 | \$500 | \$500 | \$500 |

Q & A



SESSION SCHEDULE



| Topic | |
|--|--|
| Overview & Introduction & Chapter 1: Data Management | |
| Chapter 2: Data Handling Ethics | |
| Chapter 3: Data Governance | |
| Chapter 4: Data Architecture | |
| Chapter 5: Data Modeling & Design | |
| Chapter 6: Data Storage & Operations | |
| Chapter 7: Data Security | |
| Chapter 8: Data Integration & Interoperability | |
| Chapter 9: Document & Content Management | |
| Chapter 10: Reference & Master Data | |
| Chapter 11: Data Warehousing & Business Intelligence | |
| Chapter 12: Metadata Management | |
| Chapter 13: Data Quality | |
| Chapter 14: Big Data & Data Science | |
| Chapter 15: Data Management Maturity Assessment | |
| Chapter 16: Data Management Organization & Role Expectations | |
| Chapter 17: Data Management & Organizational Change Management | |
| Final Review | |

HOMEWORK

Why is Data Architecture important and do you see examples of its implementation in your own organization? How does (or could) your organization benefit from this Data Management discipline?

Part 4: Data Architecture

AGENDA

- Facilitator Introduction
- Introductory Note
- Chapter 4: Data Architecture
 - Overview
 - What data architecture is, how it fits with other architectural domains, and why it is important
 - Architectural frameworks and why they are important
 - Architectural artifacts: Enterprise Data Model and Data Flow Diagrams
 - Approach to studying (and/or thinking about the implications of Data Architecture)
- Q & A
- Next Session

Architecture



Thinking about Chapter 4: Data Architecture

- No organization starts from scratch, from a data perspective. Even if one did, data dependencies arise quickly.
- Architecture enables a BIG PICTURE view of an organization and its data. Architectural artifacts are the means by which an organization represents its data to itself.
- It also enables a LONG-TERM view of an organization and its data. Organizations need an architectural ROADMAP to understand where they are, as well as to understand where they want to be and how to get there.
- An architectural perspective is critical to how an organization establishes its data strategy. Architecture can DRIVE INNOVATION.
- If we recognize, as Tom Redman says, that DATA IS DOING ITS WORK when it is moving through the organization and BEING USED, we will see why ideally, data architecture practices should be comprehensive, strategic, and dynamic.

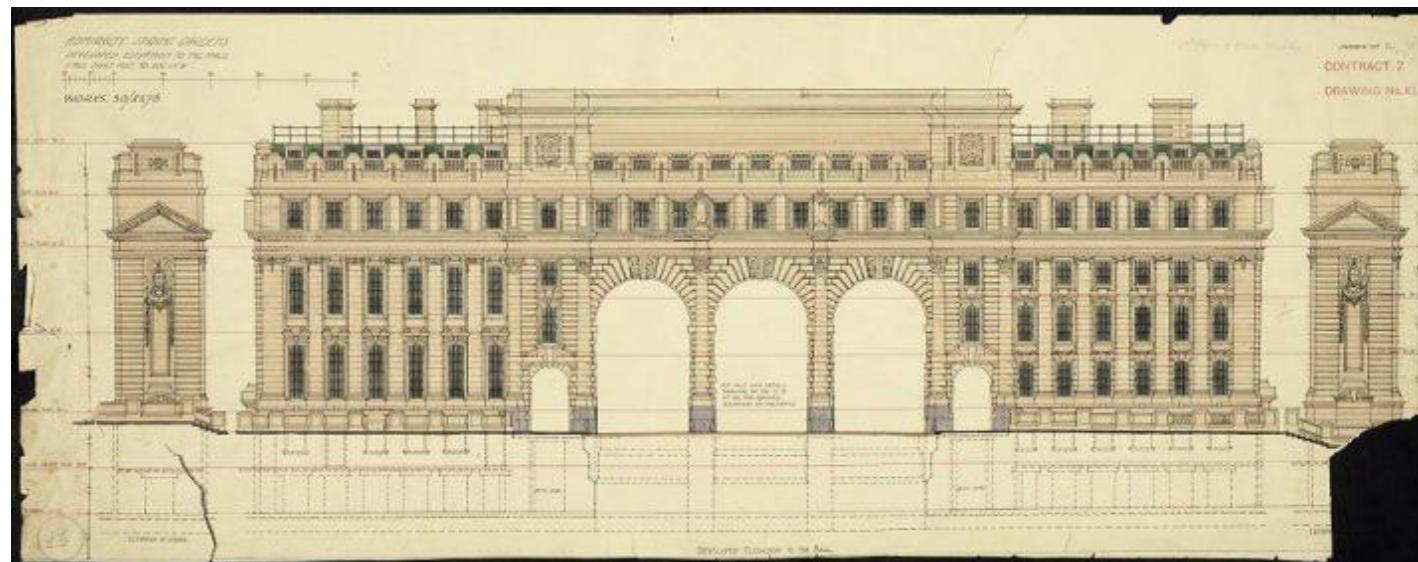


Chapter 4: Data Architecture

Identifying the data needs of the enterprise and designing and maintaining the master blueprints to meet those needs. Using master blueprints to guide data integration, control data assets, and align data investments with business strategy.

The word *Architecture* can refer to:

- A description of the current state of systems
- The components of a set of systems
- The discipline of designing systems (architecture practice)
- The intentional design of a system or a set of systems (future state or proposed architecture)
- The artifacts that describe a system (architecture documentation)
- The team that does the design work (the Architects or the Architecture team)



Data Architecture: Part of Enterprise Architecture

- **Enterprise Architecture** encompasses:
 - Business architecture
 - Data architecture
 - Application architecture
 - Technology architecture
- **Enterprise Architecture** enables an organization to:
 - Understand the current state of their systems
 - Promote desirable change toward future state
 - Enable regulatory compliance
 - Manage data
 - Manage the systems in which data is stored and used
- **Successful Architecture** depends on
 - Good design
 - Planning
 - Ensuring that the designs and plans are executed effectively
- **Data Architects** seek to
 - Design an optimal technical footprint
 - Improve operational and project efficiencies
 - Increase the ability of the organization to use its data.
- Data Architecture is most valuable when it supports the needs of the enterprise (e.g., when it accounts for the “big picture”).

WORD OF THE DAY: Perspective
Architecture is all about perspective.

Data Architecture: Part of Enterprise Architecture

| Domain | Enterprise Business Architecture | Enterprise Data Architecture | Enterprise Applications Architecture | Enterprise Technology Architecture |
|--------------|--|--|--|--|
| Purpose | To identify how an enterprise creates value for customers and other stakeholders | To describe how data should be organized and managed | To describe the structure and functionality of applications in an enterprise | To describe the physical technology needed to enable systems to function and deliver value |
| Elements | Business models, processes, capabilities, services, events, strategies, vocabulary | Data models, data definitions, data mapping specifications, data flows, structured data APIs | Business systems, software packages, databases | Technical platforms, networks, security, integration tools |
| Dependencies | Establishes requirements for the other domains | Manages data created and required by business architecture | Acts on specified data according to business requirements | Hosts and executes the application architecture |
| Roles | Business architects and analysts, business data stewards | Data architects and modelers, data stewards | Applications architects | Infrastructure architects |

Data Architecture: Business Drivers

The problems Data Architecture is trying to solve:

- **More data than the average bear!** Most organizations have more data than a single person can understand.
- **Different Levels Of detail for different decision-makers.** Data needs to be represented at different levels of detail so that people can make decisions about it.
- **Architectural Artifacts help with comprehension.** Data architects create the artifacts that enable people to understand their organization's data.

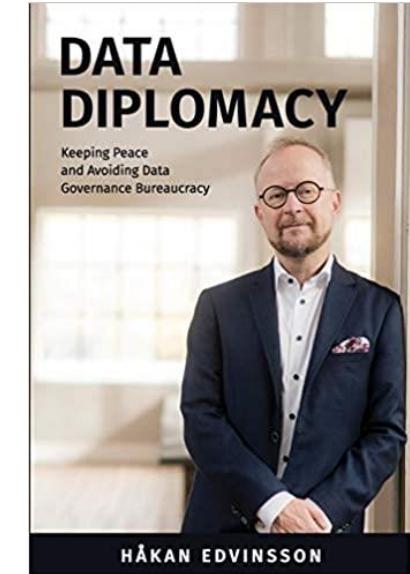
Data architecture enables organizations to:

- **Plan for evolution:** Prepare organizations to evolve products, services, and data to take advantage of business opportunities inherent in emerging technologies
- **Translate requirements:** Translate business needs into data and system requirements so that processes consistently have the data they require
- **Manage delivery:** Manage complex data and information delivery throughout the enterprise
- **Facilitate alignment** between Business and IT
- **Act as agents for change,** transformation, and agility

Architecture can
DRIVE INNOVATION!

Data Architecture from different perspectives

- Chapter Four looks at Data Architecture from three perspectives:
 - **Data Architecture outcomes /** artifacts: models, definitions and data flows on various levels of abstraction
 - **Data Architecture activities**, to form, deploy and fulfill Data Architecture intentions
 - **Data Architecture behavior:** collaborations, mindsets, and skills among the various roles that affect the enterprise's Data Architecture.
- Data Architecture artifacts (master blueprints) are used to:
 - Define data requirements
 - Guide data integration
 - Control data assets
 - Align data investments with business strategy
- Data Architects must
 - Collaborate with, learn from and influence various stakeholders that are engaged with improving the business or IT systems development
 - Help to establish the semantics of an enterprise, via a common business vocabulary



Recommended Reading:
Data Diplomacy by Hakan Edvinsson
Focuses on how architects interact with other people
in the organization to get things done.
Architecture is about people!

The Zachman Framework for Enterprise Architecture™

The Enterprise Ontology™



Architectural frameworks are important to understanding architecture as a whole.

Of these, the most influential is the Zachman Framework, which is organized around basic questions related to the perspectives of stakeholders across an enterprise.

Different stakeholders require information at different levels of abstraction.

This is wicked hard to read, so the next slide has the simplified version that appears in DMBOK2.

| | What | How | Where | Who | When | Why | |
|---------------------|--------------------------|------------------------|-----------------------------|-------------------------------|-----------------------|---------------------------|-----------------------|
| Executive | Inventory Identification | Process Identification | Distribution Identification | Responsibility Identification | Timing Identification | Motivation Identification | Scope Context |
| Business Management | Inventory definition | Process Definition | Distribution Definition | Responsibility Definition | Timing Definition | Motivation Definition | Business Concepts |
| Architect | Inventory Representation | Process Representation | Distribution Representation | Responsibility Representation | Timing Representation | Motivation Representation | System Logic |
| Engineer | Inventory Specification | Process Specification | Distribution Specification | Responsibility Specification | Timing Specification | Motivation Specification | Technology Physics |
| Technician | Inventory Configuration | Process Configuration | Distribution Configuration | Responsibility Configuration | Timing Configuration | Motivation Configuration | Tool Components |
| Enterprise | Inventory Instantiations | Process Instantiations | Distribution Instantiations | Responsibility Instantiations | Timing Instantiations | Motivation Instantiations | Operational Instances |
| | Inventory Sets | Process Flows | Distribution Networks | Responsibility Assignments | Timing Cycles | Motivation Intentions | |

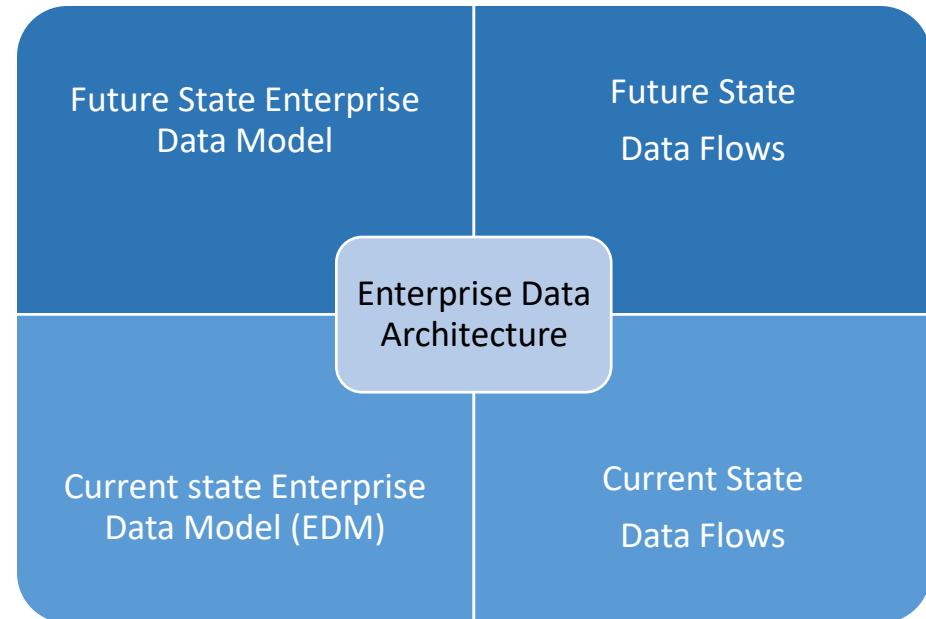
Data Architecture: EDM and Data Flow Design

Data exists in and moves through an enterprise.

Data Architecture needs to account for both the current and future state of the data model and the data flows.

Enterprise Data Model (EDM): The EDM is a holistic, enterprise-level, implementation-independent conceptual or logical data model providing a common consistent view of data across the enterprise. It sets forth the foundation for all data and data-related projects. ... Any project-level data model must be based on the EDM. The EDM should be reviewed by stakeholders, so that there is consensus that it effectively represents the enterprise.

Data Flow Design: Defines the requirements and master blueprint for storage and processing across databases, applications, platforms, and networks (the components). These data flows map the movement of data to business processes, locations, business roles, and to technical components.



The EDM

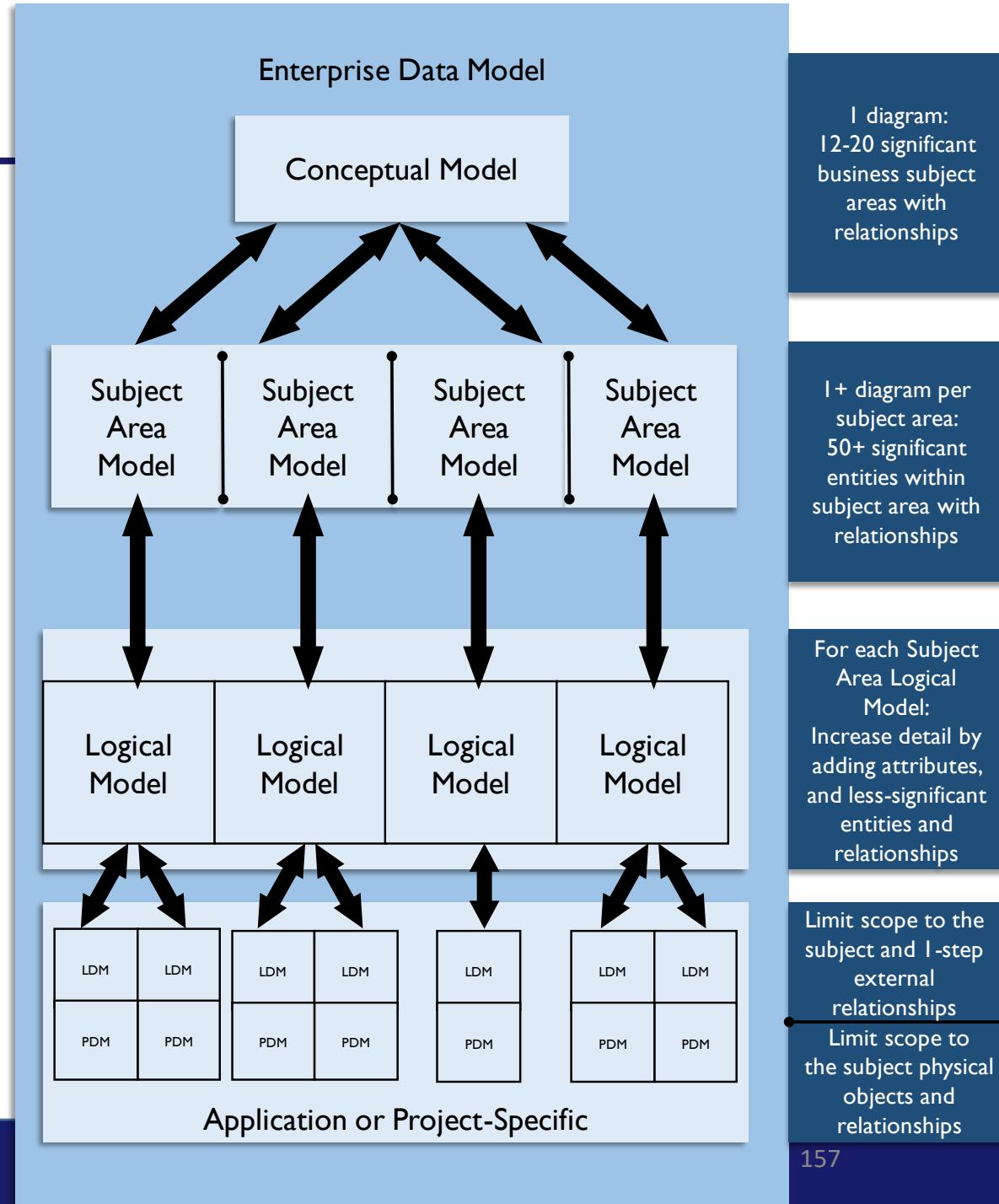
The EDM can be a stand-alone artifact, or it can be comprised of the overall set of models created by the enterprise.

Different types of models – at different levels of abstraction – must be related to each other.

Conceptual models are ultimately linkable to physical application data models

The diagram shows:

- A conceptual overview over the enterprise's subject areas
- Views of entities and relationships for each subject area
- Detailed, partially attributed logical views of these same subject areas
- Logical and physical models specific to an application or project



The Subject Area Model

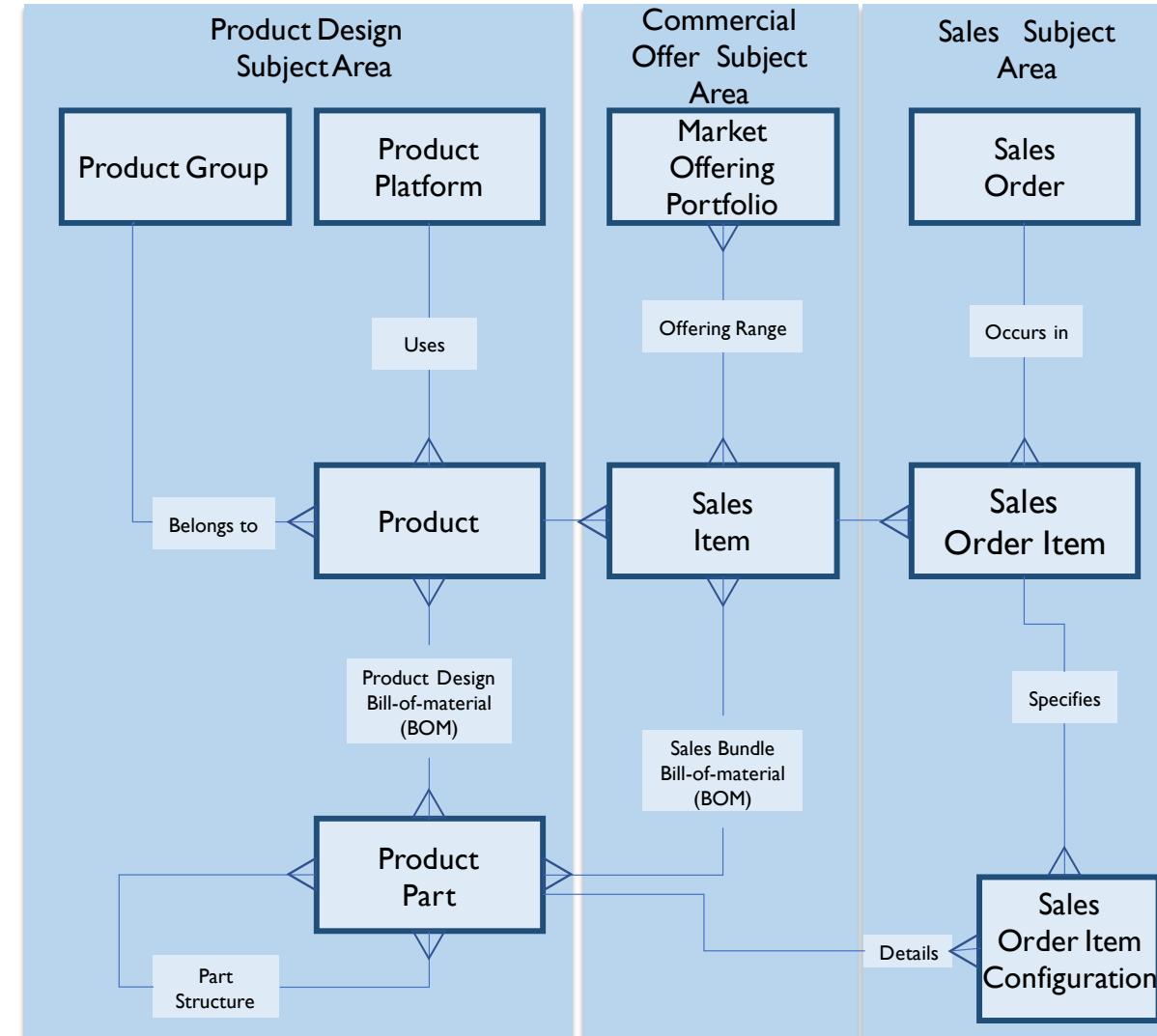
EDM can be:

- A stand-alone artifact OR
- Comprised of the overall set of models created by the enterprise

Establish a principle for division of subject areas (a subject area discriminator). For example,

- Normalization rules
- Systems portfolios (i.e., funding)
- Data governance structure and data ownership (organizational)
- Top-level processes (based on the business value chains)
- Business capabilities (enterprise architecture-based)

The Subject Area structure is usually most effective for Data Architecture work if it is formed using normalization rules.

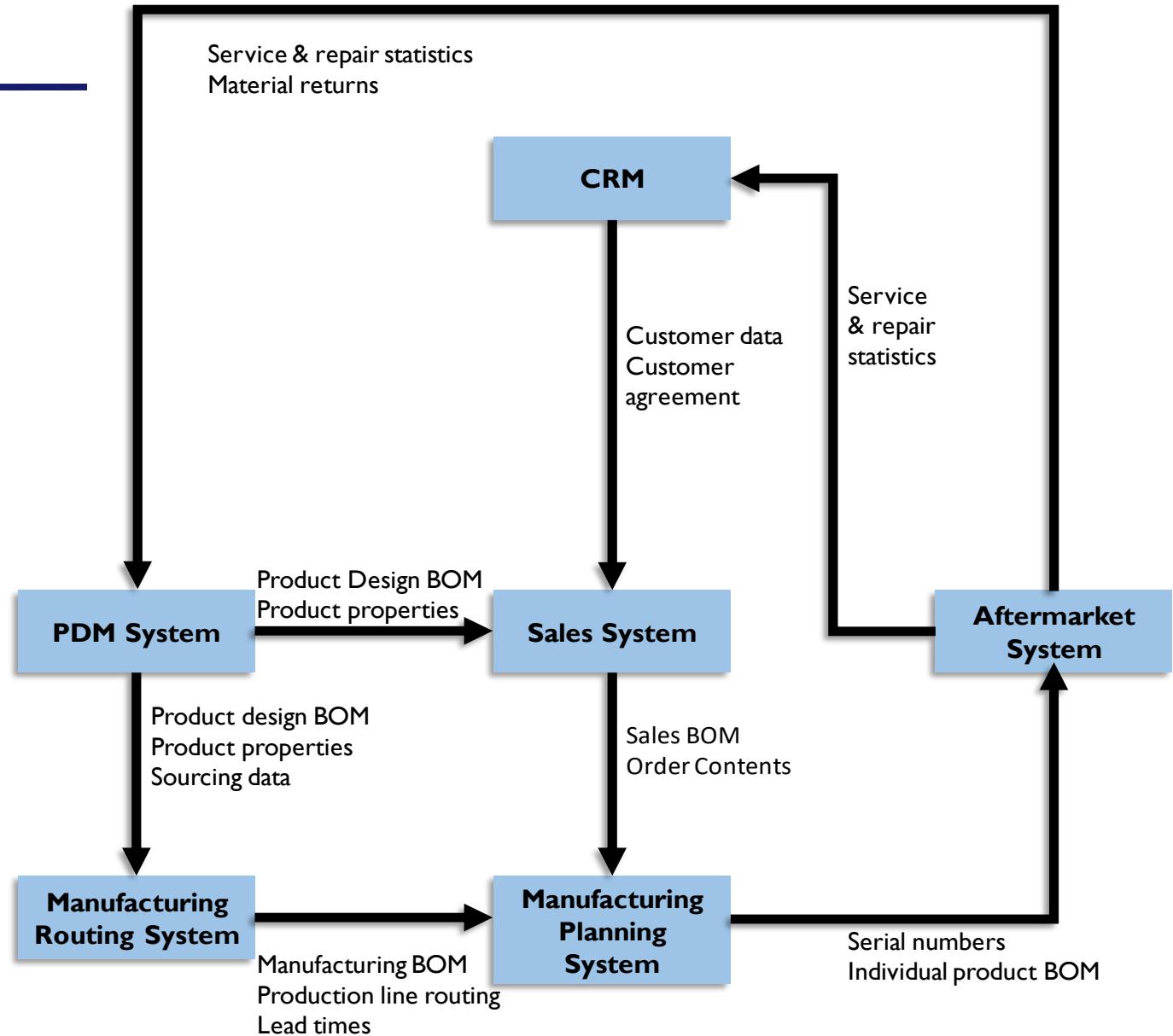


Data Flows

Data Flow diagrams depict how data moves through an organization. Data flows can be organized in different ways.

This traditional high-level flow diagram shows the movement of data between different systems that support business processes.

Such a diagram can be created with different levels of detail, depending on the audience and purpose.

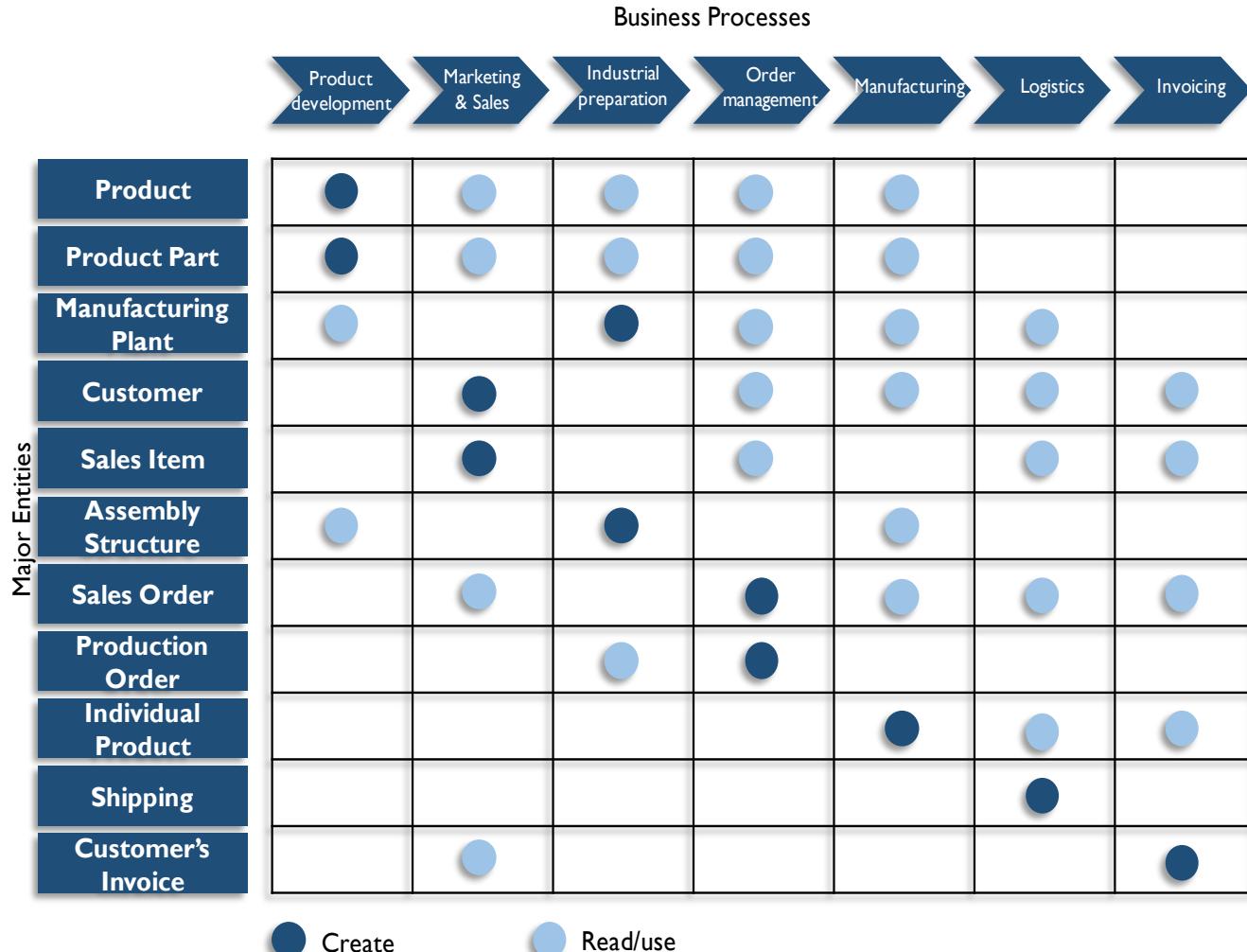


Data Flows

This matrix shows the relationship between business processes and data entities that create or use data.

Benefits of a matrix depiction:

- Shows that data does not flow in just one direction
- Shows many-to-many relationships
- Can clarify data acquisition responsibilities
- Can clarify data dependencies between processes



Data Architecture Activities: Establish the practice

Establish Data Architecture Practice

- Part of Enterprise Architecture OR adopt a framework

Account for

- Strategy
- Culture
- Organizational accountabilities, responsibilities
- Work methods
- Results / relation to roadmap

Relationship to projects

- Defining requirements
- Reviewing project data design
- Determining data lineage impact
- Data replication control
- Enforce Architecture standards
- Guide technology decisions

Evaluate Existing Specifications

Develop a roadmap

Manage enterprise requirements within projects

Data Architecture Activities

Evaluate and Update Existing Specifications

Develop a roadmap

- Manage dependencies
- Make forward-looking decisions
- Evaluate trade-offs
- Formulate pragmatic plans, aligned with business needs and opportunities, external requirements, and available resources.
- To develop a roadmap, start with the lowest dependency activities

Manage enterprise requirements within projects

- Bring an enterprise perspective to project scope
- Understand requirements
- Ensure implementation makes sense in terms of the overall architecture

Note: The role of the enterprise data architect will depend in part on the implementation methodology (e.g., waterfall, agile, hybrid)

Discussion / Q&A: How to study ...

Architectural Frameworks

Architectural Artifacts

The role of the Data Architect

Strategy / Projects

Innovation / Quality



NEXT SESSION

| Topic |
|--|
| Chapter 1: Data Management |
| Chapter 2: Data Handling Ethics |
| Chapter 3: Data Governance |
| Chapter 4: Data Architecture |
| Chapter 6: Data Storage & Operations |
| Chapter 5: Data Modeling & Design |
| Chapter 7: Data Security |
| Chapter 8: Data Integration & Interoperability |
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| Chapter 12: Metadata Management |
| Chapter 13: Data Quality |
| Chapter 14: Big Data & Data Science |
| Chapter 15: Data Management Maturity Assessment |
| Chapter 16: Data Management Organization & Role Expectations |
| Chapter 17: Data Management & Organizational Change Management |
| Final Review |

Dates and order of delivery are
subject to change!
Check the web site.
<https://damanewengland.org/>



HOMEWORK – Data Storage and Operations

Why is the role of Database Administrator important in the support of Data Governance efforts?

Part 5: Data Modeling

AGENDA

Introduction

- Facilitator Introduction
- Chapter Overview
- Data Modeling and Design
 - 1. Introduction
 - 2. Activities
 - 3. Tools
 - 4. Best Practices
 - 5. Data Model Governance
- Q & A
- Next Session

Activities

Tools

Best Practices

Governance

Possible Study Group Scenarios

1. You meant to read the chapter but section 1 was impenetrable
2. You started the chapter and got lost somewhere in Section 1.3
3. You made it through the chapter but you don't remember much
4. You are a data architect and know this cold, so you are wondering how we're going to get through this chapter in under an hour
5. You've been homeschooling your kids and want a break right now so you're hoping this won't be as boring as you fear it might be

I DREW YOU A MAP – I HOPE IT HELPS

MODELS are Requirements for **Business Entities, Attributes, and Relationships**



TIP: Prepare by first reading **Navigating the Labyrinth**

Chapter 6, *Planning and Design in Data Lifecycle Management*

What Is Data Modeling and Design?

Data Modeling and Design

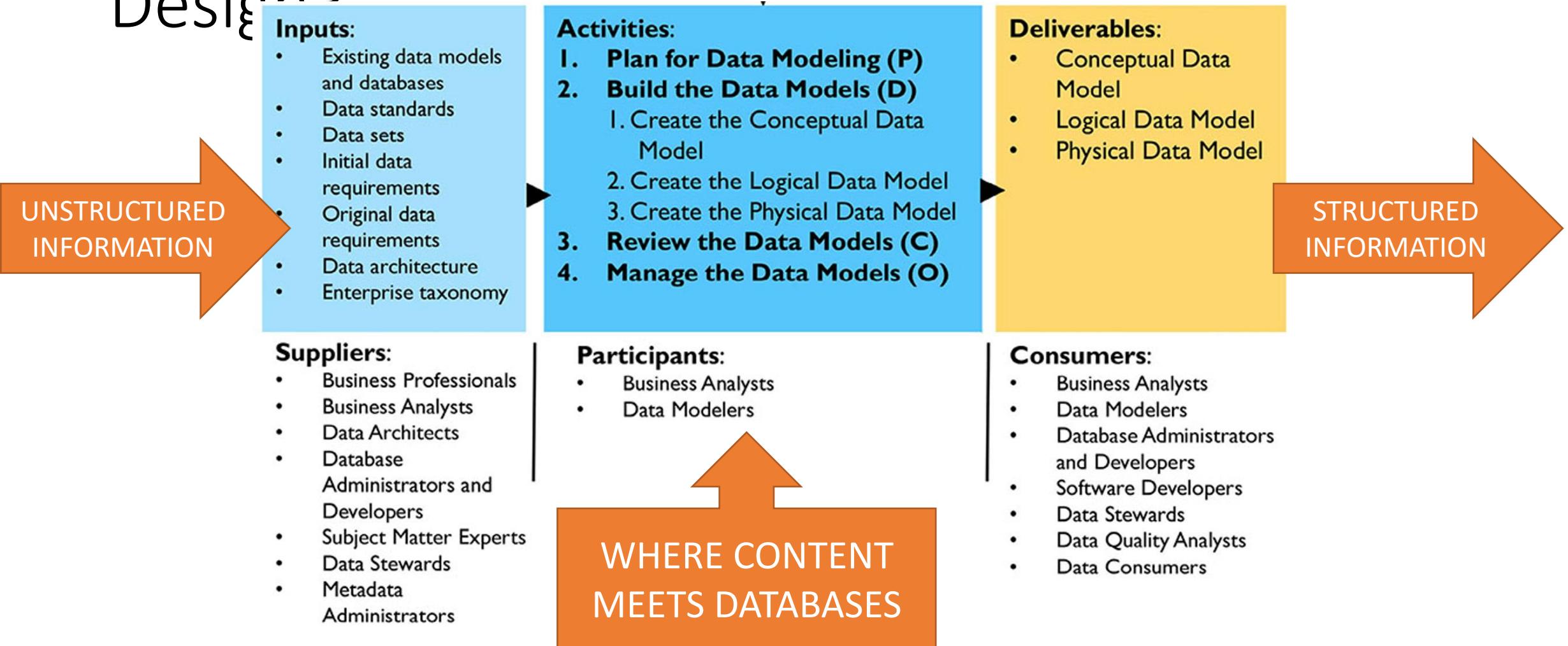
Definition: Data modeling is the process of discovering, analyzing, and scoping data requirements, and then representing and communicating these data requirements in a precise form called the data model. This process is iterative and may include a conceptual, logical, and physical model.

Goal:

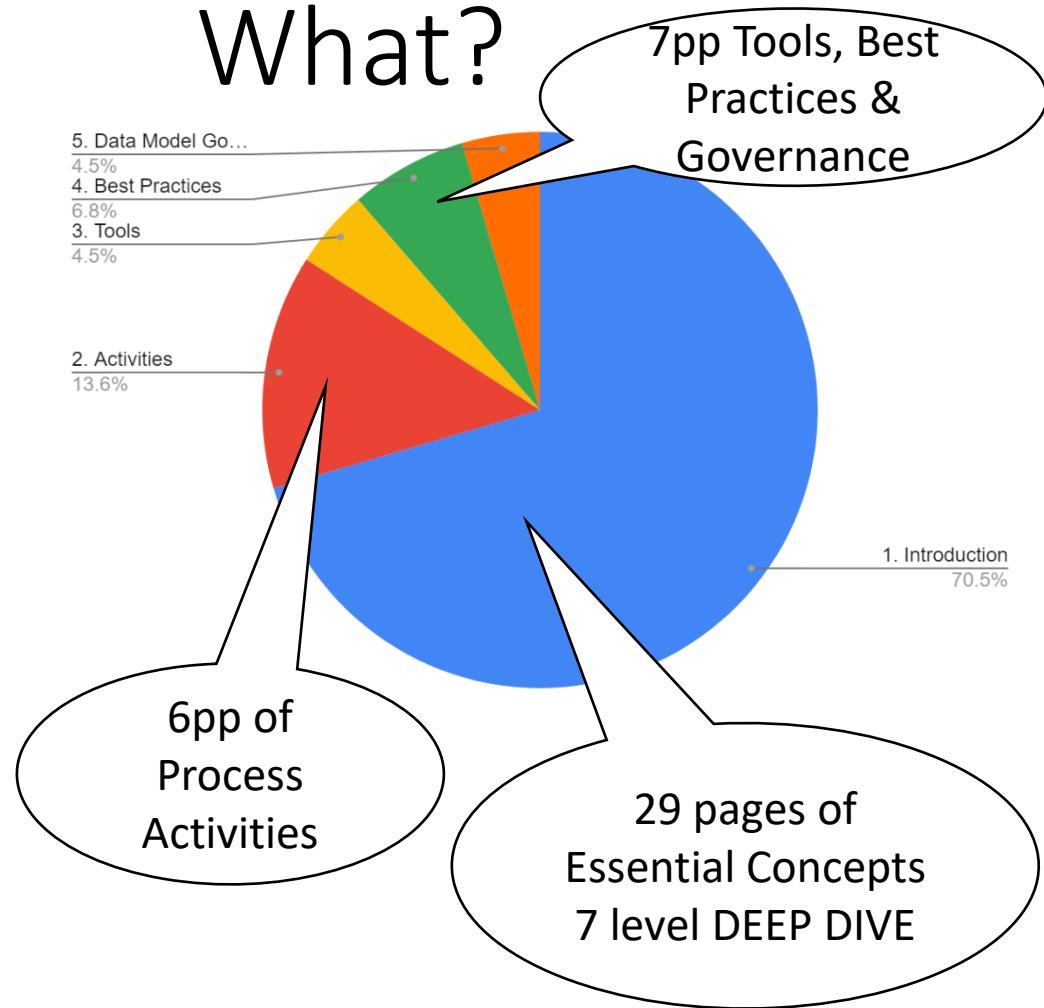
To confirm and document an understanding of different perspectives, which leads to applications that more closely align with current and future business requirements, and creates a foundation to successfully complete broad-scoped initiatives such as master data management and data governance programs.

Business
Drivers


Who Does What in Data Modeling and Design?



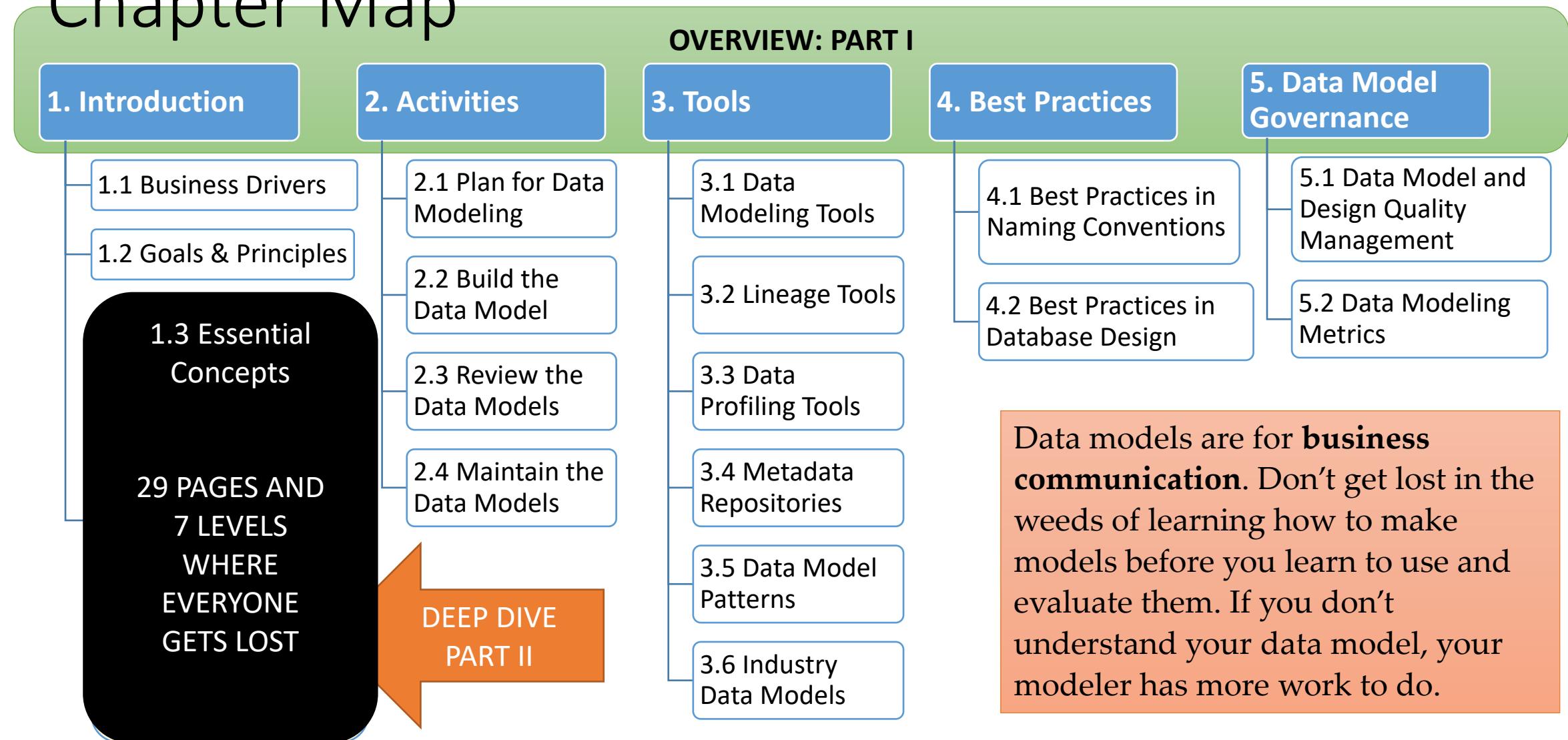
What's In 44 Pages and Who Needs to Know What?



| DATA MODELING ROLE | Supply | Participate | Consume |
|-----------------------------|----------|-------------|----------|
| Business Professionals/SMEs | Y | | |
| Business Analysts | Y | Y | Y |
| Data Architects | Y | | |
| DBAs/Developers | Y | | Y |
| Data Stewards | Y | | Y |
| Metadata Admins | Y | | |
| Data Modelers | | Y | Y |
| Software Developers | | | Y |
| Data Quality Analysts | | | Y |
| Data Consumers | | | Y |
| 10 ROLES | 6 | 2 | 7 |

It takes more people to use models than to make them

Chapter Map



Introduction

Activities

Tools

Best Practices

Governance

Business Drivers, Goals, and Principles

1.1 Business Drivers

Common vocabulary

Documentation

Communication

Starting point for app customization, integration, or replacement

1.2 Goals and Principles

Formalization

Scope definition

Knowledge retention and documentation

“The data model becomes a **reusable map** to help business professionals, project managers, analysts, modelers, and developers understand **data structure within the environment**. In much the same way as the mapmaker learned and documented a geographic landscape for others to use for **navigation**, the modeler enables others to understand an **information landscape** (Hoberman, 2009).”

Essential Concepts Overview

Introduction

1.3.1 Data Modeling and Data Models

Diagram

Pattern

Map

Blueprint

Communication

1.3.2 Types of Data Modeled

Categories

- Attributes

Resources

- Reference

Events

- Transactional

Transaction Details

- Big Data

1.3.3 Data Model Components

1.3.3.1 Entity

1.3.3.2 Relationship

1.3.3.3 Attributes

1.3.3.4 Domain

1.3.4 Data Modeling Schemes

1.3.4.1 Relational

1.3.4.2 Dimensional

1.3.4.3 Object-Oriented (UML)

1.3.4.4 Fact-Based Modeling (FBM)

1.3.4.5 Time-Based

1.3.4.6 NoSQL

1.3.5 Data Model Levels of Detail

1.3.5.1 Conceptual

1.3.5.2 Logical

1.3.5.3 Physical

1.3.6 Normalization

1NF

2NF

3NF

BCNF

4/5NF

1.3.7 Abstraction

Generalization

- Supertypes

Specialization

- Subtypes

WE WILL COME BACK TO THIS IN THE DEEP DIVE

HOLD THAT THOUGHT!

2. Activities

Introduction

Activities

Tools

Best Practices

Governance

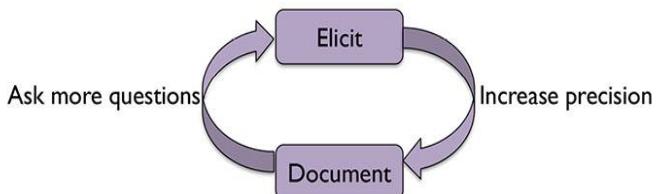


Figure 53 Modeling is Iterative

2.1 Plan for Data Modeling

- Diagrams
- Definitions
- Issues and questions
- Lineage

2.2 Build the Data Model

- 2.2.1 Forward Engineering
 - **CDM, LDM, PDM**
- 2.2.2 Reverse Engineering

2.3 Review the Data Models

- Quality Control
- Continuous Improvement

2.4 Maintain the Data Models

- Update when change occurs
- Sync physical to logical models

Suppliers

Participants

Consumers

Governance

MINI-DIVE

2.2.1.1 Conceptual Data Modeling (CDM)

Introduction

Activities

Tools

Best Practices

Governance

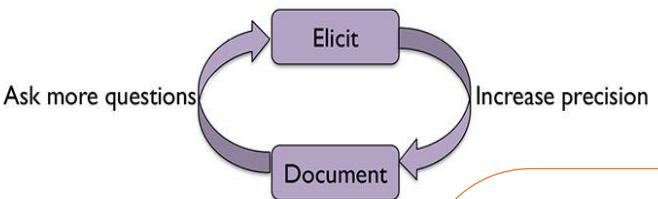


Figure 53 Modeling is Iterative

Enterprise Taxonomy

Select Scheme

- relational, dimensional, OO, fact-based, time-based, NoSQL

Select Notation

- Standards
- User familiarity

Complete Initial CDM

- concepts (nouns)
=Entities
- activities (verbs)
=Relationships

Incorporate Enterprise Terminology

Obtain Sign-off

Successful projects will iterate/change back up to this level during LDM and PDM – managing expectations is key

This might not look like a model yet: it often starts as a glossary

This never stops

2.2.1.2 Logical Data Modeling (LDM)

Introduction

Activities

Tools

Best Practices

Governance

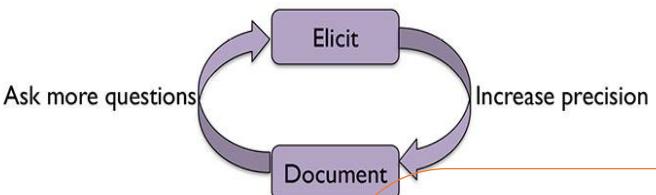


Figure 53 Modeling is Iterative

Entity-Relationship Diagram

2.2.1.2.1 Analyze Information Requirements

2.2.1.2.2 Analyze Existing Documentation

2.2.1.2.3 Add Associative Entities

2.2.1.2.4 Add Attributes

2.2.1.2.5 Assign Domains

2.2.1.2.6 Assign **Keys** (Relationships)

For effective transformation, stay focused on future state and key gaps

Domain in this context means the complete set of assignable values

2.2.1.3 Physical Data Modeling (PDM)

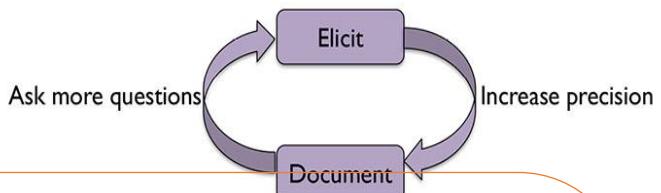
Introduction

Activities

Tools

Best Practices

Governance



Development has often started by now

Figure 52 Modeling in Iteration 8

2.2.1.3.1 Resolve Logical Abstractions

2.2.1.3.2 Add Attribute Details

2.2.1.3.3 Add Reference Data Objects

2.2.1.3.4 Assign Surrogate Keys

2.2.1.3.5 Denormalize for Performance

2.2.1.3.6 Index for Performance

2.2.1.3.7 Partition for Performance

2.2.1.3.8 Create Views

Hybrid cloud platforms are disruptive to PDM

DevOps teams need architectural guidance to execute transformation during continuous delivery

Productized data models are disruptive to PDM

This will stop scaling

2. Activities

| | DATA MODELING ROLE | Supply | Participate | Consume |
|----------------|-----------------------------|----------|-------------|----------|
| Introduction | Business Professionals/SMEs | Y | | |
| Activities | Business Analysts | Y | Y | Y |
| Tools | Data Architects | Y | | |
| Best Practices | DBAs/Developers | Y | | Y |
| | Data Stewards | Y | | Y |
| Governance | Metadata Admins | Y | | |
| | Data Modelers | | Y | Y |
| | Software Developers | | | Y |
| | Data Quality Analysts | | | Y |
| | Data Consumers | | | Y |
| | 10 ROLES | 6 | 2 | 7 |

This is not “continuous delivery of working software,” but is critical to it

2.3 Review the Data Models

- Quality Control
- Continuous Improvement

2.4 Maintain the Data Models

- Update when change occurs
- Sync physical to logical models

GOVERNANCE

BEST PRACTICE

3. Tools

Data Catalogs

Reference Models

Introduction

Activities

Tools

Best Practices

Governance

3.1 Data Modeling Tools

Drawing

Rubber-banding

Forward-engineering with DDL

Reverse engineering

Metadata

Sharing

3.2 Lineage Tools

Attribute source structures

Impact analysis

Integration Tools

3.3 Data Profiling Tools

Data exploration

Metadata validation

Data quality analysis

Data model validation

3.4 Metadata Repositories

Stores descriptive model

Sharing

Viewing and navigation

3.5 Data Model Patterns

Reusable

Elementary patterns

Assembly patterns

Integration patterns

3.6 Industry Data Models

Prebuilt for an industry domain

Broad and detailed

Reference model for customization

Data catalogs are “toolboxes” that include varying bundles of these tools

4. Best Practices

Introduction

Activities

Tools

Best Practices

Governance

4.1 Best Practices in Naming Conventions

ISO 11179 Metadata Registry

Complement related IT standards

Meaningful to business users

Minimize name changes across environments

4.2 Best Practices in Database Design (PRISM)

Performance and ease of use

Reusability

Integrity

Security

Maintainability

5.1 Data Model and Design Quality Management

Introduction

Activities

Tools

Best Practices

Governance

**5.1.1 Develop
Data Modeling
and Design
Standards**

**5.1.2 Review Data
Model and
Database Design
Quality**

**5.1.3 Manage
Data Model
Versioning and
Integration**

Governance teams can get bogged
down here – adopt a scorecard

5.2 Data Modeling Metrics

Introduction

Activities

Tools

Best Practices

Governance

Table 11 Data Model Scorecard® Template

| # | Data governance teams will usually need training and practice to answer model scoring questions | Total score | Model score | % | Comments |
|-------------|---|-------------|-------------|---|---|
| 1 | How well does the model capture the requirements? | 15 | | | |
| 2 | How complete is the model? | 15 | | | |
| 3 | How well does the model match its schema? | 10 | | | |
| 4 | How structurally sound is the model? | 15 | | | |
| 5 | How well does the model leverage generic structures? | 10 | | | |
| 6 | How well does the model follow naming standards? | 5 | | | |
| 7 | How well has the model been arranged for readability? | 5 | | | |
| 8 | How good are the definitions? | 10 | | | |
| 9 | How consistent is the model with the enterprise? | 5 | | | |
| 10 | How well does the metadata match the data? | 10 | | | |
| TOTAL SCORE | | 100 | | | (Data Modeling for Digital Transformation with Data Vault, Noel 2020 DVA) |

Essential Concepts Deep Dive

Components

1.3.1 Data Modeling and Data Models

1.3.2 Types of Data Modeled

1.3.3 Data Model Components

1.3.4 Data Modeling Schemes

1.3.5 Data Model Levels of Detail

1.3.6 Normalization

1.3.7 Abstraction

Schemes

Diagram

Categories

Pattern

Resources

Map

Events

Blueprint

Transactions

Communication

Levels of Detail

1.3.3.1 Entity

1.3.3.2 Relationship

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1.3.4.5 Time-Based

1.3.4.6 NoSQL

Normalization

1.3.5.1 Conceptual

1.3.5.2 Logical

1.3.5.3 Physical

1NF

2NF

3NF

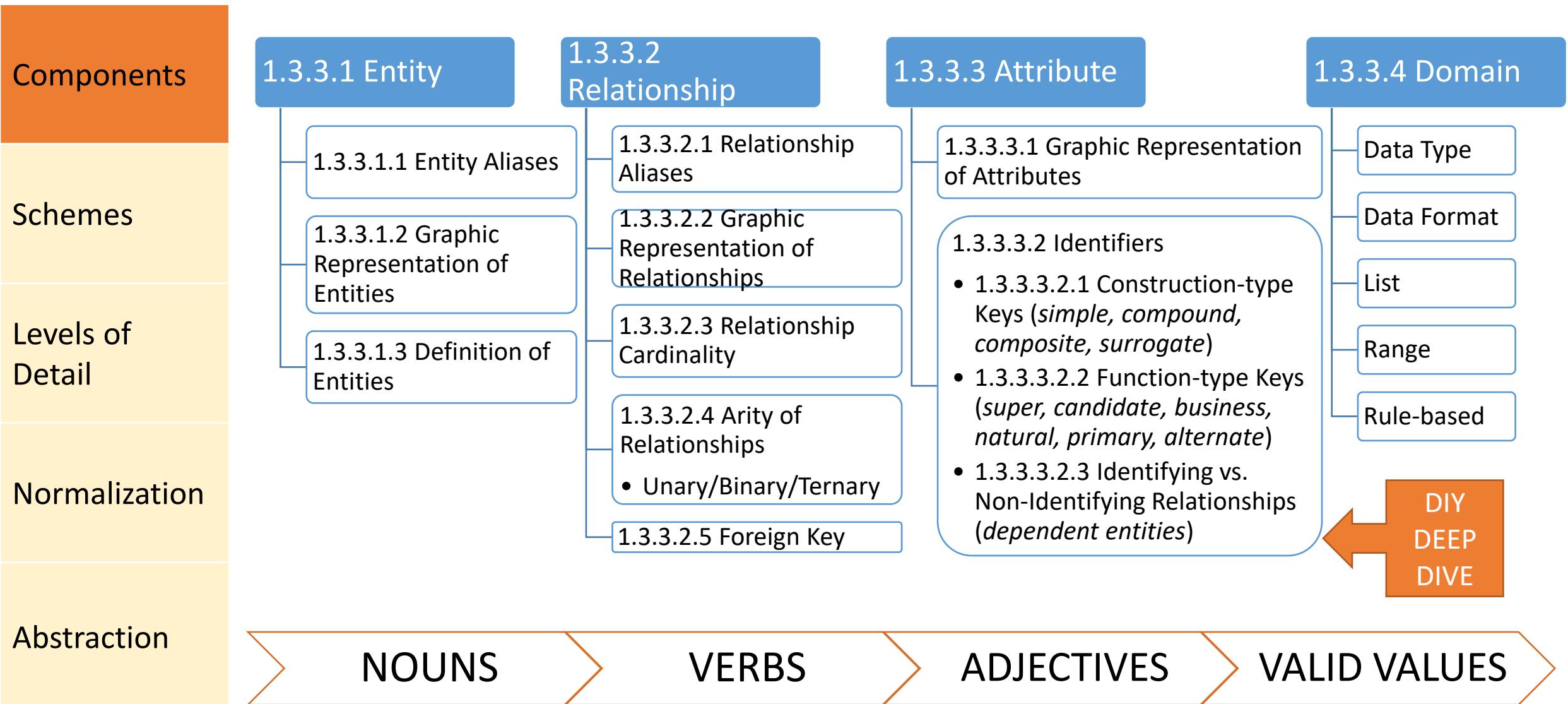
BCNF

4/5NF

Abstraction

DEEP DIVE
PART II: 25 MIN

1.3.3 Data Model Components

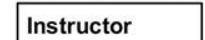
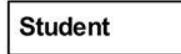


1.3.3 Data Model Components – Graphic

Components

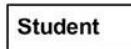
representation

E/R in ERD



Teach

Figure 29 Entities



Attend

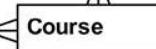
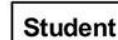


Figure 30 Relationships

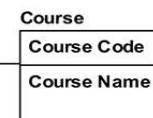
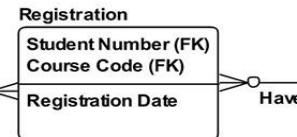
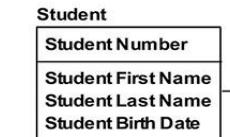
CARDINALITY (HOW MANY)



Attend



Figure 31 Cardinality Symbols



ATTRIBUTES & FOREIGN KEYS

ASSOCIATIVE ENTITY

Figure 36 Foreign Keys

ARITY (# ENTITIES)

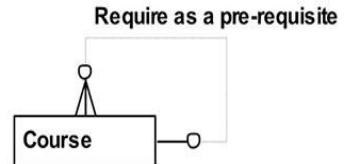


Figure 32 Unary Relationship - Hierarchy

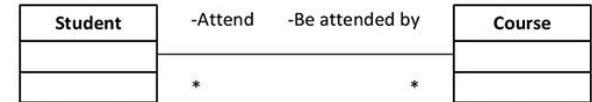
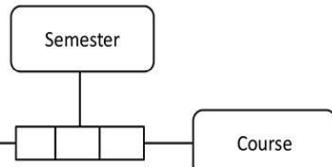
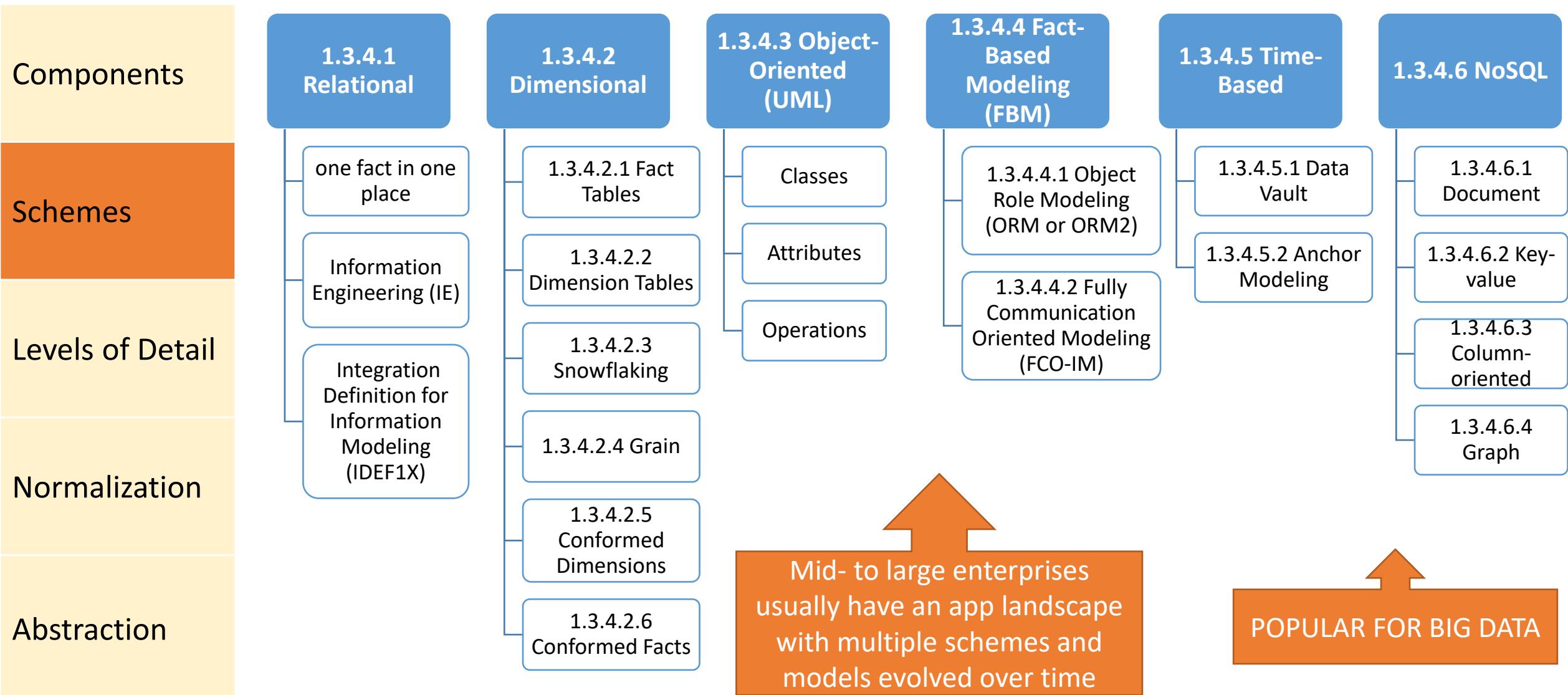


Figure 35 Ternary Relationship



1.3.4 Data Modeling Schemes



1.3.4 Data Modeling Schemes and Graphical

Components

Schemes

Levels of Detail

Normalization

Abstraction

AXIS
ation

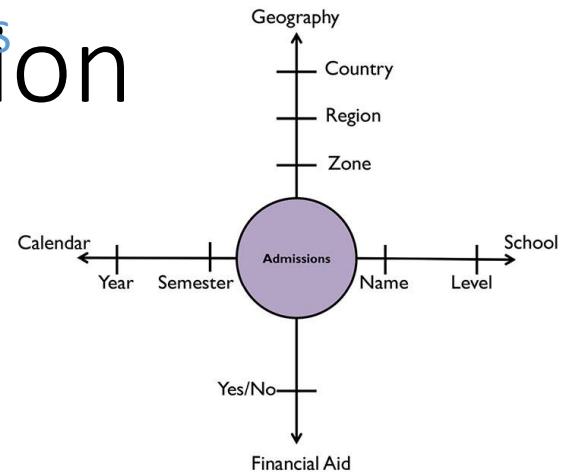
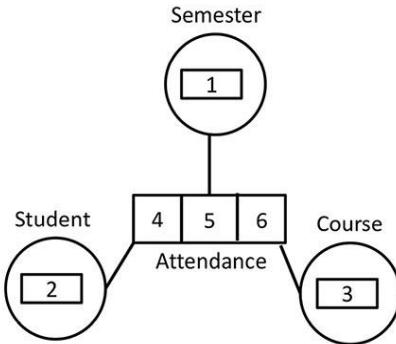


Figure 40 Axis Notation for Dimensional Models

FCO-IM



DATA VAULT

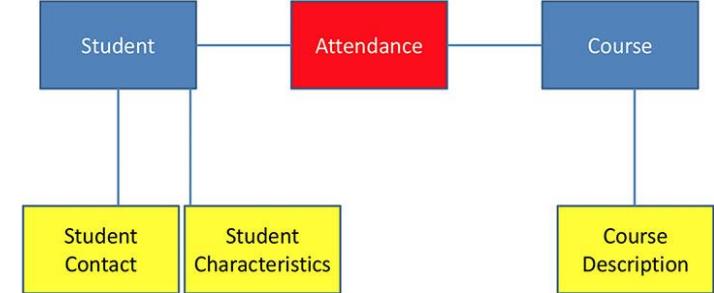


Figure 44 Data Vault Model

UML

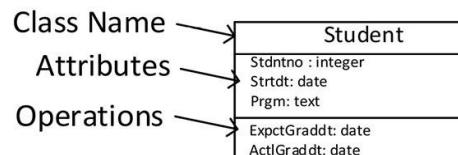


Figure 41 UML Class Model

ORM

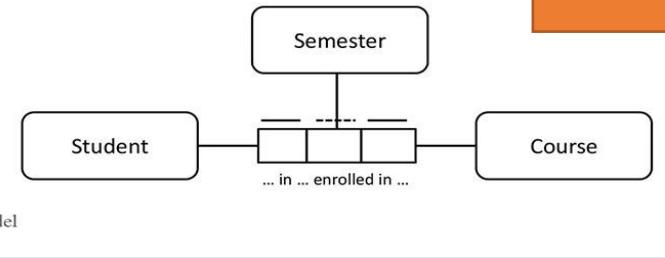


Figure 42 ORM Model

BPMN is increasingly used as business-readable notation for data modeling

ANCHOR

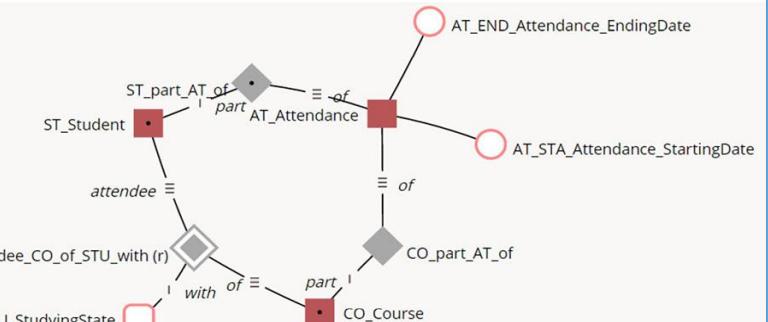


Figure 45 Anchor Model

1.3.5 Data Model Levels of Detail – LDM vs. PDM

Components

Schemes

Levels of Detail

Normalization

Abstraction

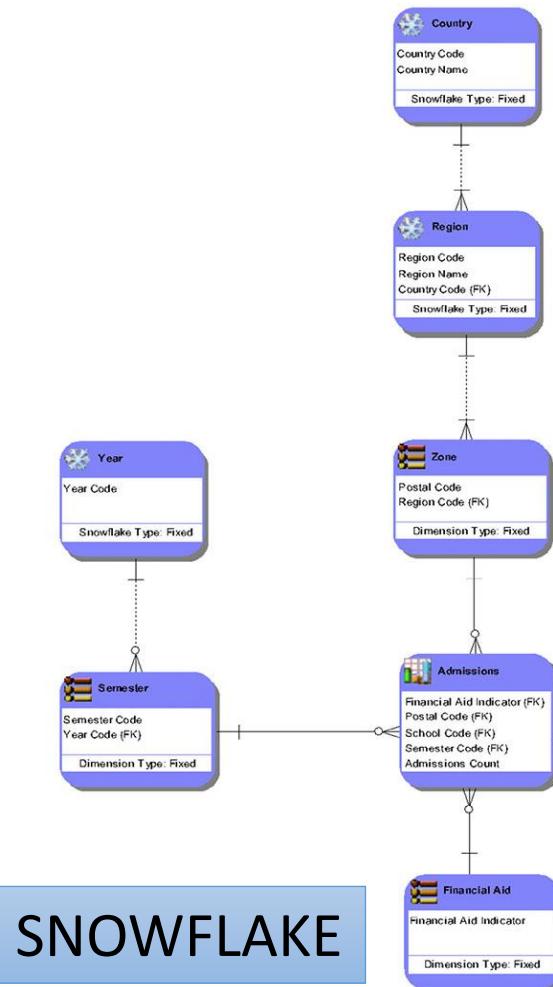


Figure 49 Dimensional Logical Data Model

- Country, Region, Postal Code included in Zone
- School Level included in School
- Year included in Semester



Normalizing
(Snowflaking)
To 1-5 NF

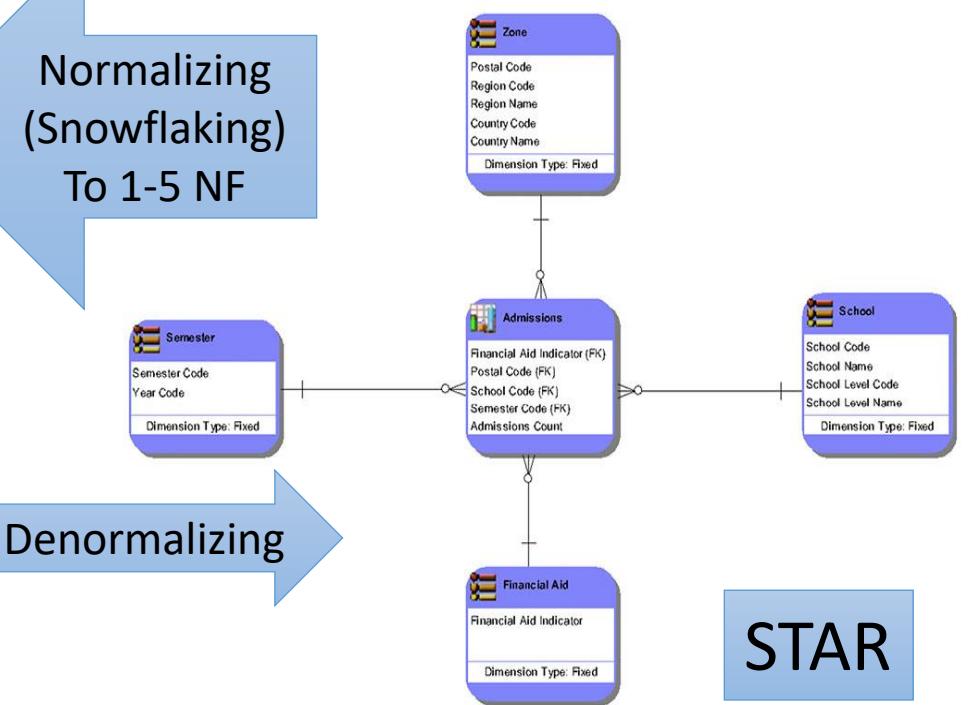
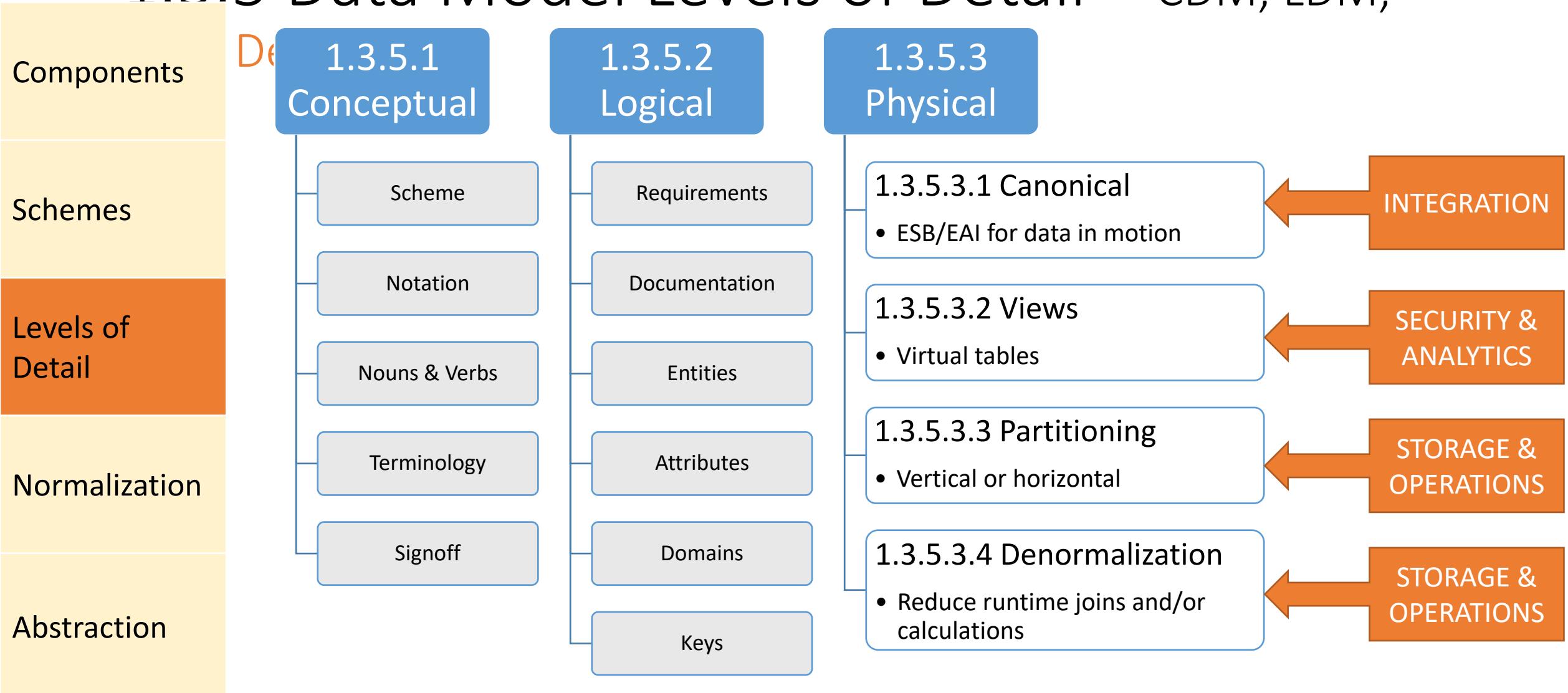


Figure 51 Dimensional Physical Data Model

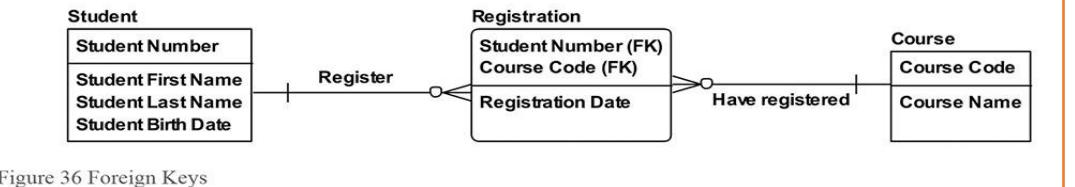
STAR

1.3.5 Data Model Levels of Detail – CDM, LDM,



1.3.6 Normalization Rules

Each level comprises a separate normal form, and each successive level does not need to include previous levels.

| Components | First normal form (1NF) | Second normal form (2NF) | Third normal form (3NF) | Boyce / Codd normal form (BCNF) | Fourth normal form (4NF) | Fifth normal form (5NF) |
|--|--|--|--|--|--|--|
| Schemes | <ul style="list-style-type: none"> each entity has a valid primary key every attribute depends on the primary key removes repeating groups each attribute is atomic (not multi-valued) resolution of many-to-many relationships with associative entities | <ul style="list-style-type: none"> each entity has the minimal primary key every attribute depends on the complete primary key | <ul style="list-style-type: none"> each entity has no hidden primary keys each attribute depends on no attributes outside the key “the key, the whole key and nothing but the key” | <ul style="list-style-type: none"> Resolves overlapping composite candidate keys. A candidate key is either a primary or an alternate key. Composite means more than one Overlapping means there are hidden business rules between the | <ul style="list-style-type: none"> Resolves all many-to-many-to-many relationships (and beyond) in pairs until they cannot be broken down into any smaller pieces. | <ul style="list-style-type: none"> Resolves inter-entity dependencies into basic pairs all join dependencies use parts of primary keys. |
| Levels of Detail | | | | | | |
| Normalization | | | | | | |
| Abstraction | | | | | | |
|  <p>Figure 36 Foreign Keys</p> | <p>Situations requiring BCNF, 4NF, and 5NF occur rarely.</p> | | | | | |

1.3.7 Abstraction

| |
|------------------|
| Components |
| Schemes |
| Levels of Detail |
| Normalization |
| Abstraction |

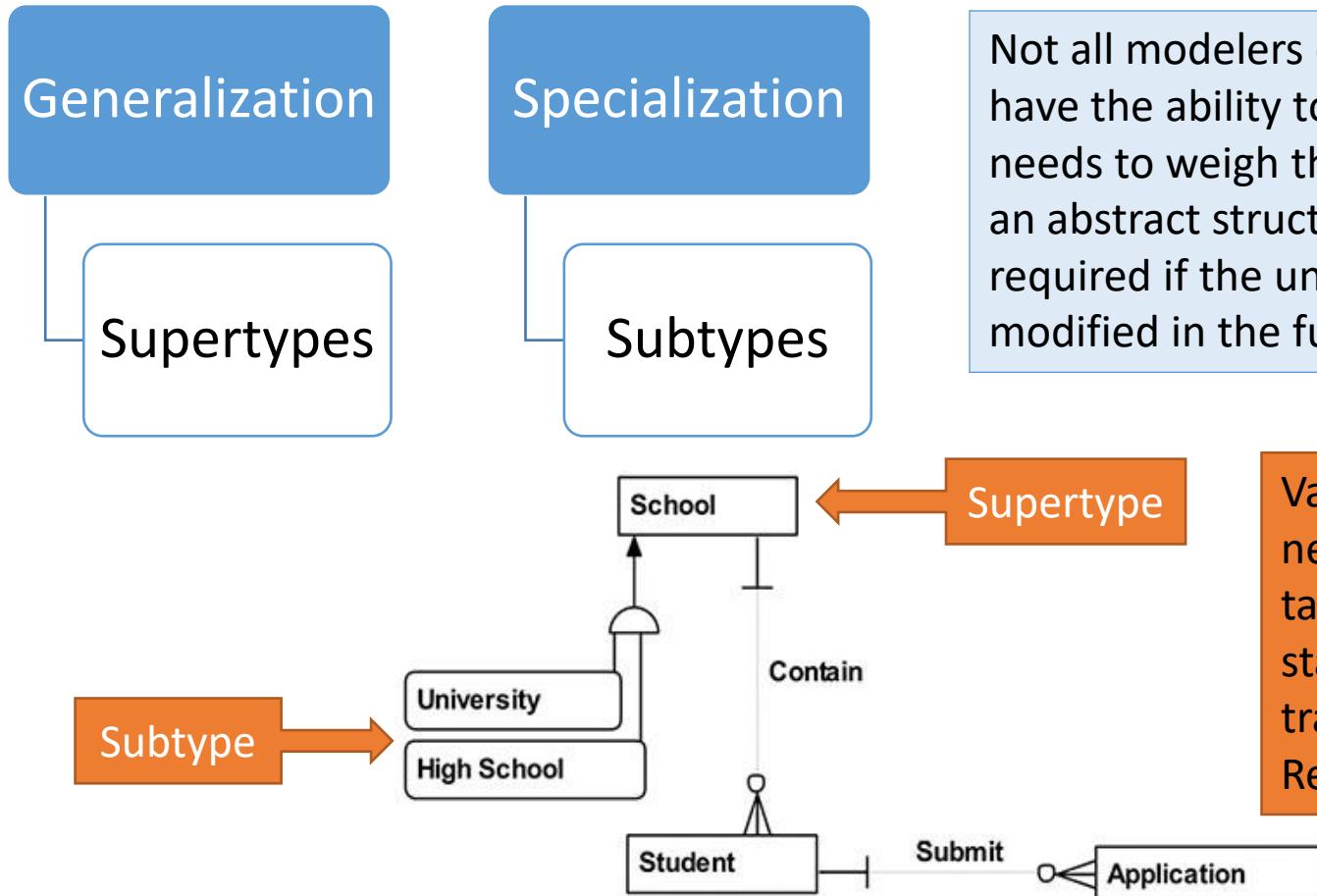
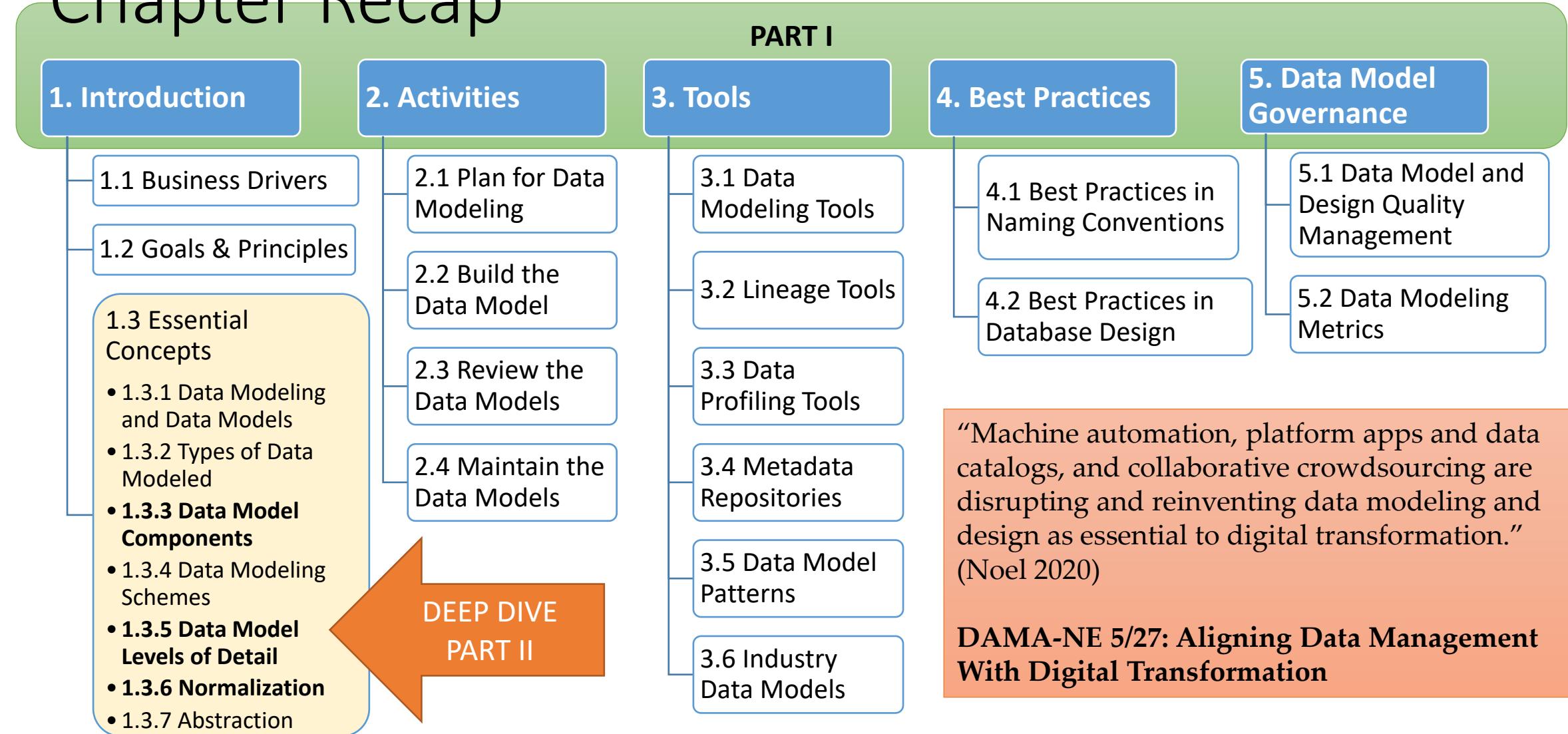


Figure 52 Supertype and Subtype Relationships

Not all modelers or developers are comfortable with, or have the ability to work with abstraction. The modeler needs to weigh the cost of developing and maintaining an abstract structure versus the amount of rework required if the unabstracted structure needs to be modified in the future (Giles 2011).

Varying degrees of abstraction are necessary for developing an enterprise taxonomy, reconciling legacy and future-state models, and executing digital transformation at speed and scale. Rework is a byproduct of Agile methods.

Chapter Recap



NEXT UP Karen Sheridan: Data Storage and Operations

How are cloud and hybrid data management impacting data storage and operations?

Q & A



NEXT SESSION



| Topic and Links to Materials | |
|--|--|
| Overview & Introduction & Chapter 1: Data Management | |
| Chapter 2: Data Handling Ethics | |
| Chapter 3: Data Governance | |
| Chapter 4: Data Architecture | |
| Chapter 6: Data Storage & Operations | |
| Chapter 5: Data Modeling & Design | |
| Chapter 7: Data Security | |
| Chapter 8: Data Integration & Interoperability | |
| Chapter 9: Document & Content Management | |
| Chapter 10: Reference & Master Data | |
| Chapter 11: Data Warehousing & Business Intelligence | |
| Enjoy | |
| Chapter 12: Metadata Management | |
| Chapter 13: Data Quality | |
| Chapter 14: Big Data & Data Science | |
| Chapter 15: Data Management Maturity Assessment | |
| Chapter 16: Data Management Organization & Role Expectations | |
| Chapter 17: Data Management & Organizational Change Management | |
| Final Review | |

Part 6: Data Storage and Ops

AGENDA

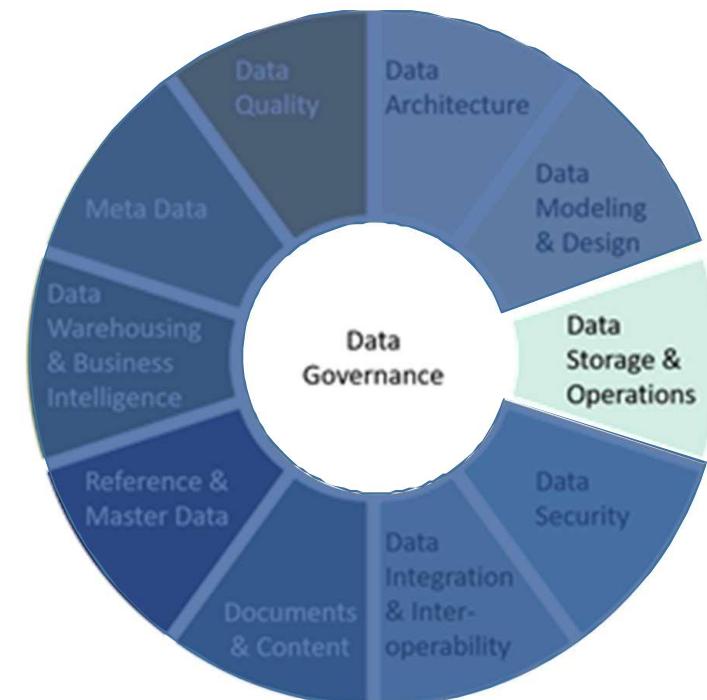
- Facilitator
- Introductory Note
- Chapter 6
 - Overview
 - Critical points
 - Discussion
- Q & A
- Next Session

Chapter 6: Data Storage

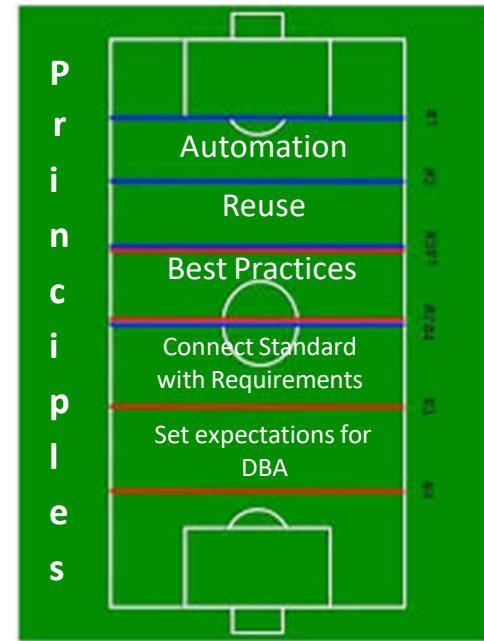
Data Storage and Operations includes the design, implementation, and support of stored data to maximize its value. Operations provide support throughout the data lifecycle from planning for to disposal of data.

Database Support – The activities related to the data lifecycle

Database Technology Support – Defining technical requirements



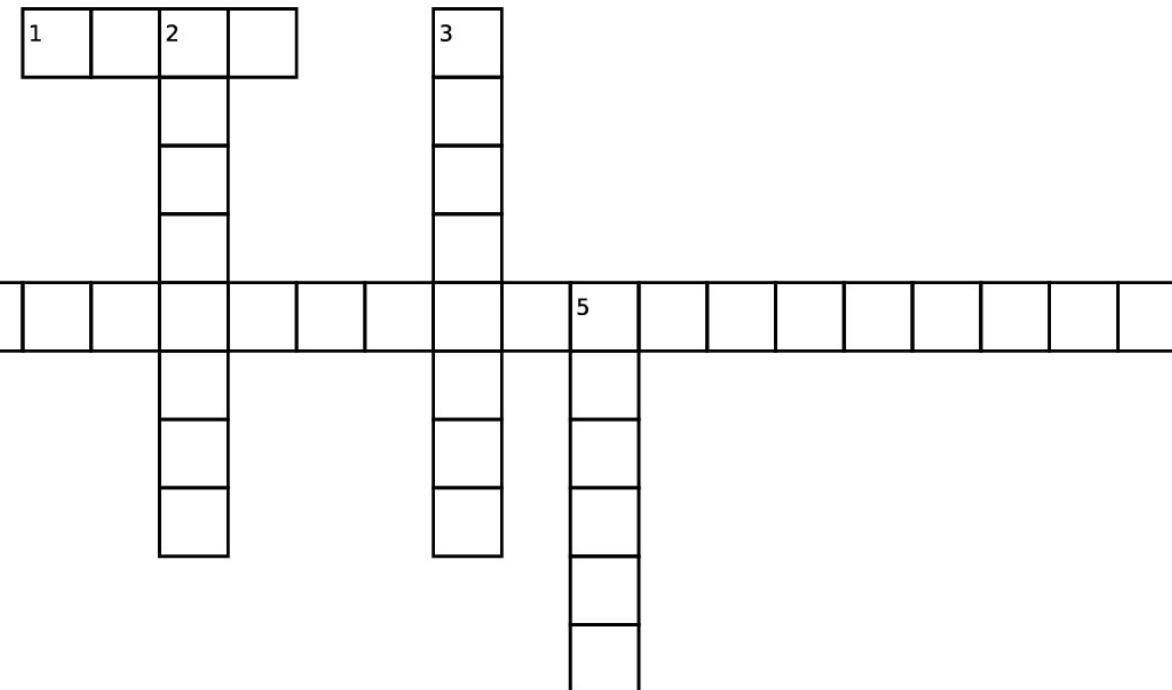
Business Driver



Terminology

Across

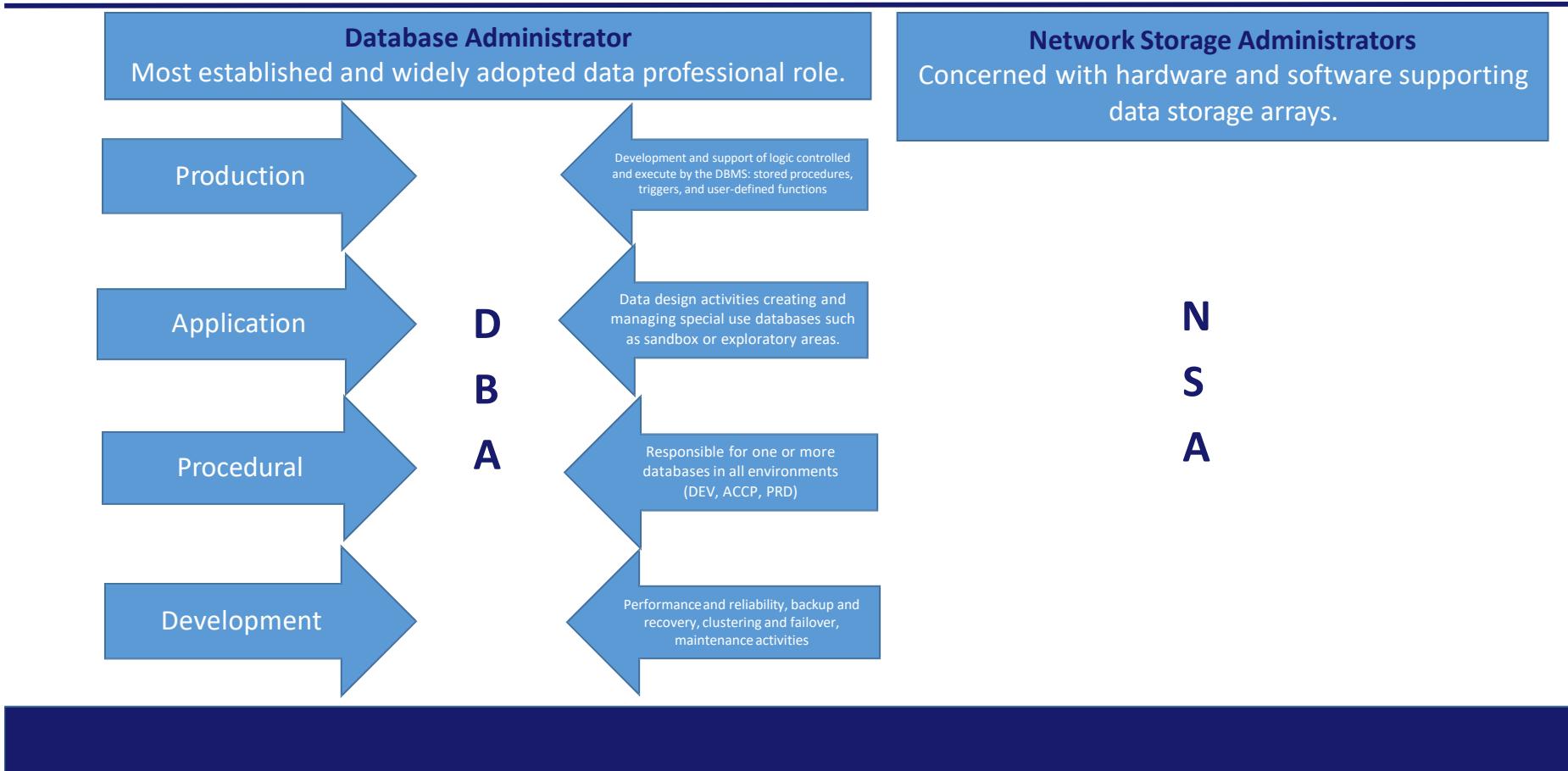
1. Individual computer hosting either processing or data as part of a distributed database.
4. A common API is used to call database functions without the programmer having to know all function calls for all possible databases



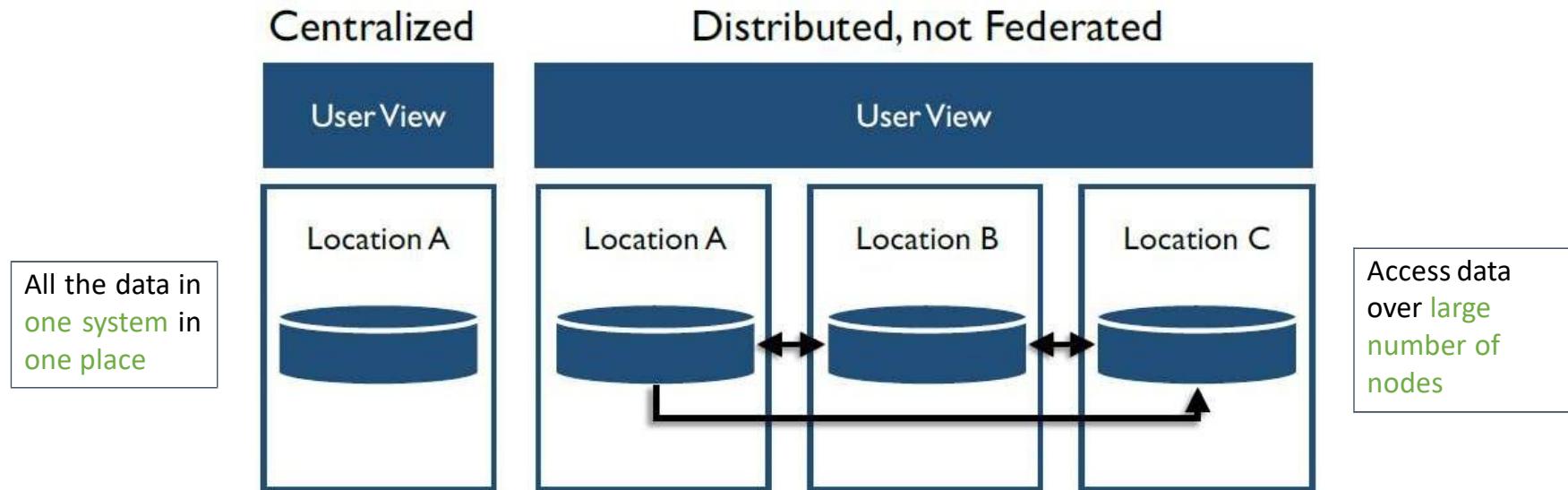
Down

2. Any collection of stored data, regardless of structure or content
3. An execution of database software controlling access to a certain area of storage
4. A subset of a database objects contained within the database or an instance.

Roles

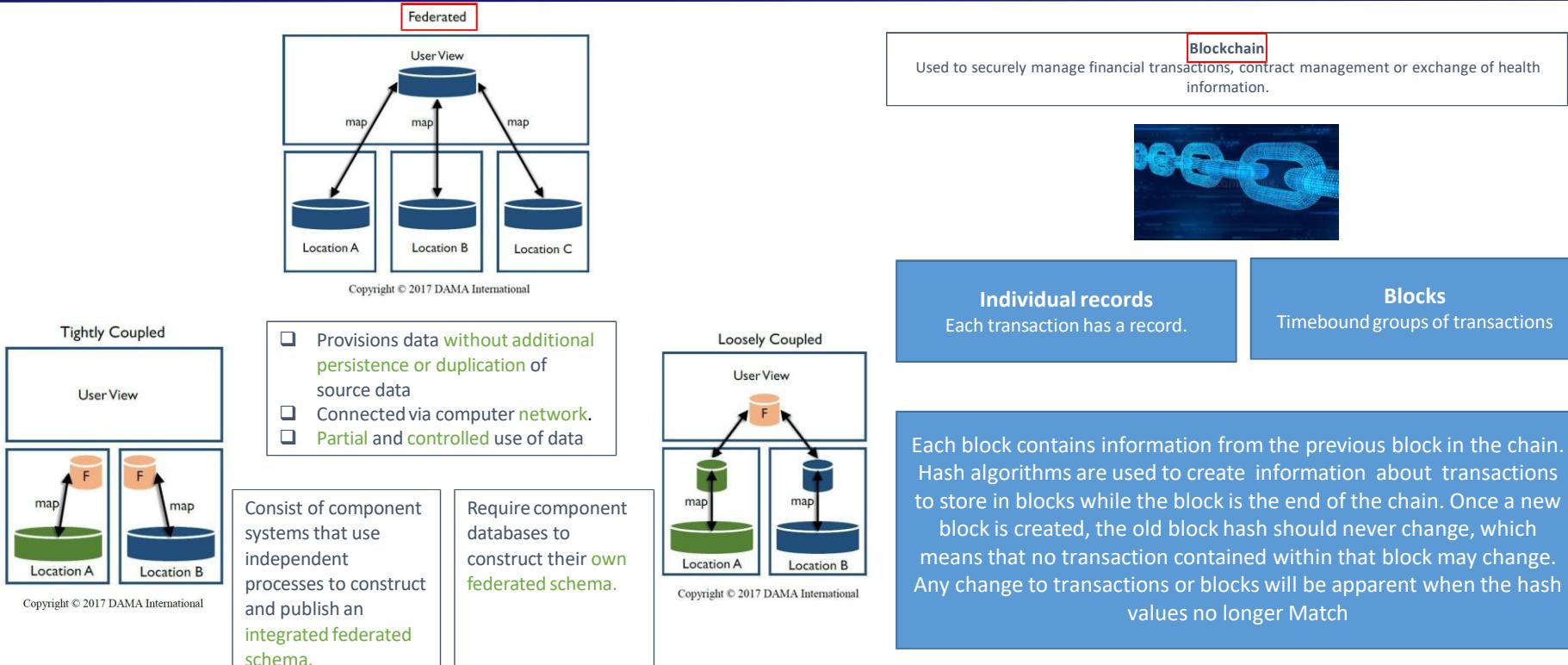


Database Types



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Distributed Databases



Virtualization/Cloud Platforms

Provides computation, software, data access, and storage services that **do not require end-user knowledge of the physical location and configuration** of the system that delivers the service(s)

Virtual Machine Image

{Purchase an instance for specified time}

Database-as-a-Service

{Without physically launching an instance}

Managed Database Hosting

{Cloud provider hosts and manages on the owners behalf}

Systematic Integrated Project Approach

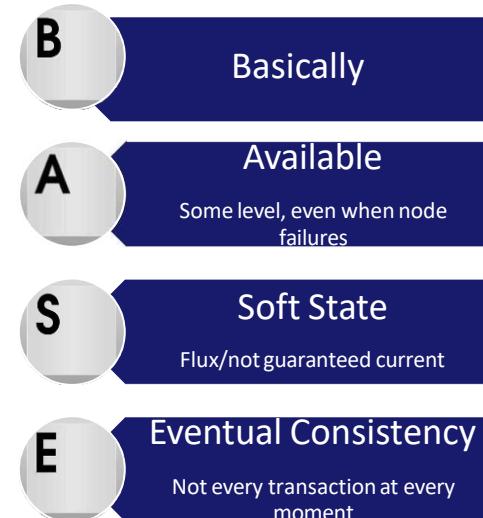
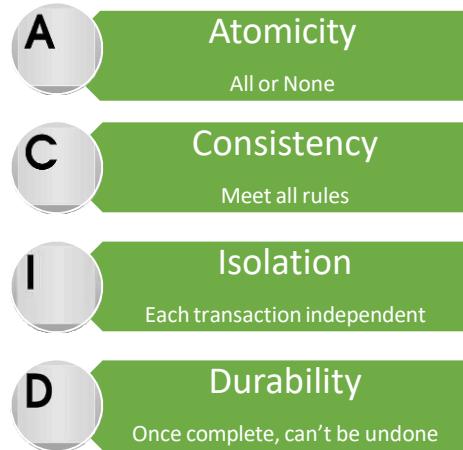
Standardization/Consolidation – reduce the number of data stores and processes

Server virtualization – replace or consolidate lowering expenses and reduces energy consumption

Automation – automate provisioning, configuration, patching, release management and compliance

Security – integrated with existing security of physical infrastructures

Database Processing Types

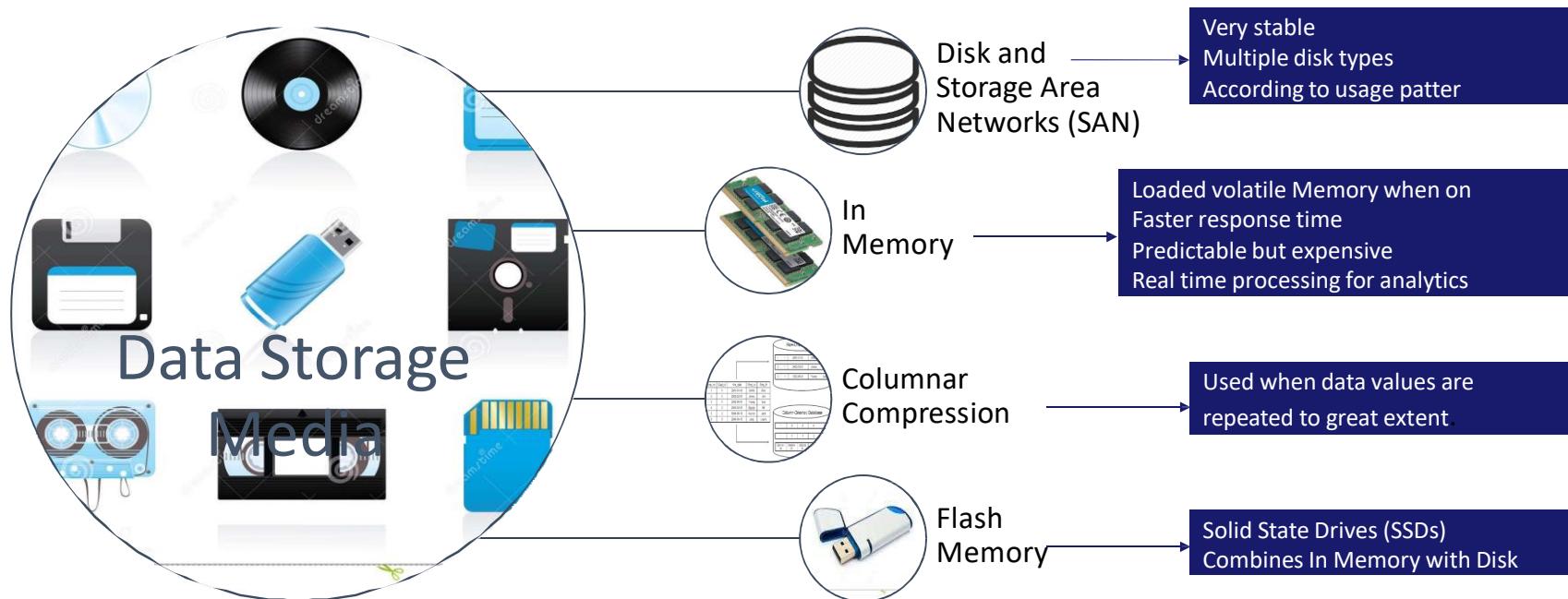


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Data Storage

Media



Database Environments



Development



Pre-production



Production

Slimmer version
Less space, fewer CPUs, Less RAM
Isolated

Develop and test changes
Closely resembles Production

All business processes occur
Mission Critical
“Real”



Test

Quality Assurance
Integration testing
UAT
Performance testing

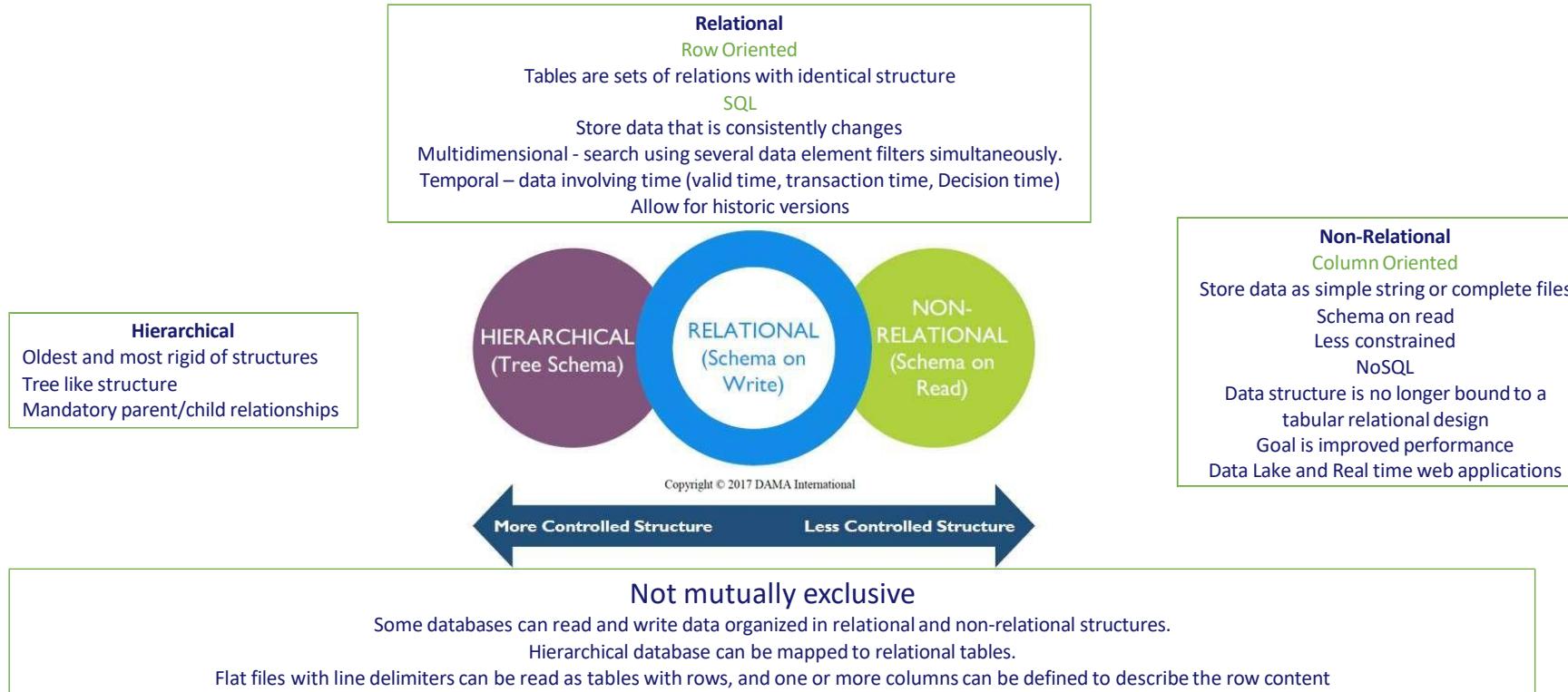


Sandbox

Read only connection to production data.
Experiment with development options
Test hypotheses
PoC.



Database Organization



Database Organization

Non-Relational

Column Oriented

- More efficient when an aggregate needs to be computed over many rows for smaller subset of columns of data
- More efficient when new values of a column are supplied for all rows at once
- Online Analytical Processing (OLAP)

Column-oriented – compress redundant data

Spatial – objects defined in geometric shapes, use indexes

 Spatial Measurement

 Spatial Functions

 Spatial Predicates

 Geometry Constructors

 Observer Functions

Object / Multi-media – magnetic and optical storage media

Flat File – Plain text, or binary

Key-Value pair – a key identifier and a value

 Document databases

 Graph Databases

Triplestore – Subject, predicate, object

 Subject – denotes the resource

 Predicate – expresses the relationship between

 Object – Itself

Relational

Row Oriented

- More efficient when many columns of a single row are required at the same time and when row size is small
- More efficient when writing a new row if all the row data is supplied at the same time.
- Online Transaction Processing (OLTP)

Specialized Databases

Computer Assisted Design and Manufacturing - CAD/CAM

Geographical Information Systems - GIS

Shopping cart application

Common Database Processes

Archiving

Moving data from immediately accessible storage media onto media with lower retrieval performance

Capacity and Growth Projections

Determine the size of container? How much it will hold? What will come out? How quickly?

Change Data Capture (CDC)

Detecting that data has changed. Storing the info about the change. Only sending the delta

Purging

Completely removing data from storage media such that it can not be recovered

Replication

Storing the same data on multiple storage devices.

Resiliency and Recovery

Immediate (by design)
Critical (restore as quickly as possible)
Non-critical (restoration of function can be delayed)

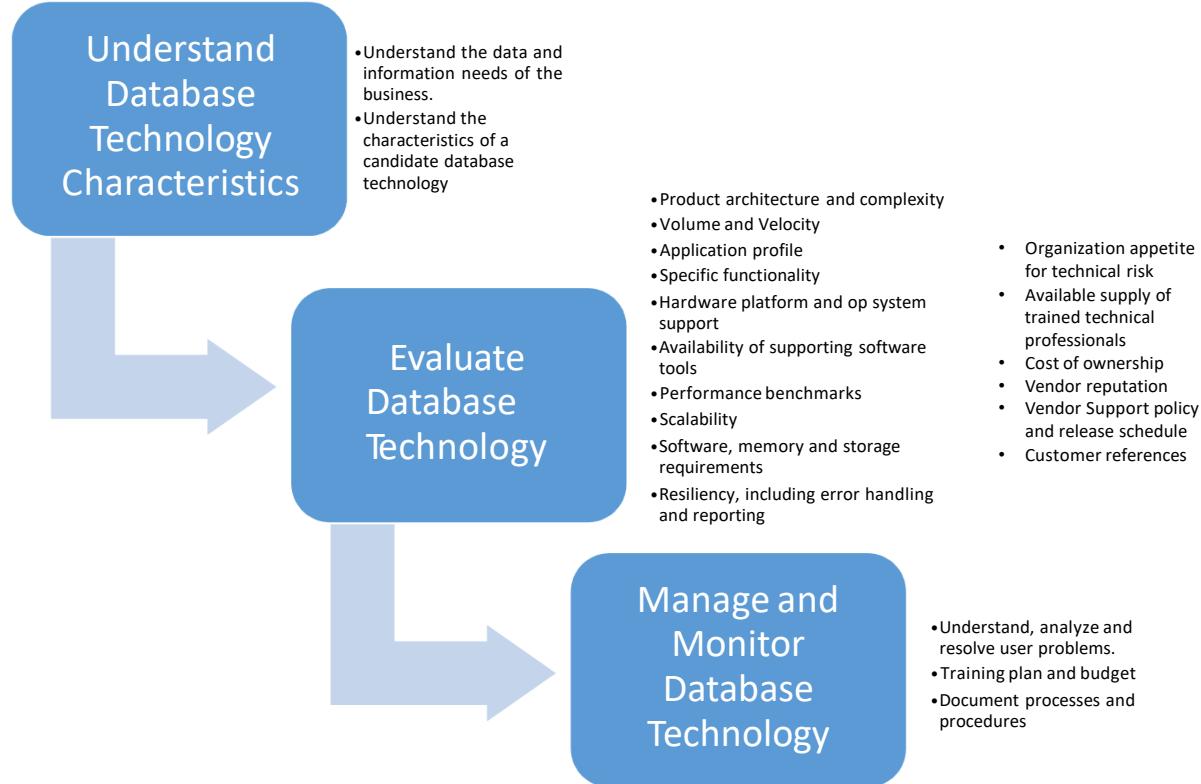
Retention

How long data is kept
Security considerations

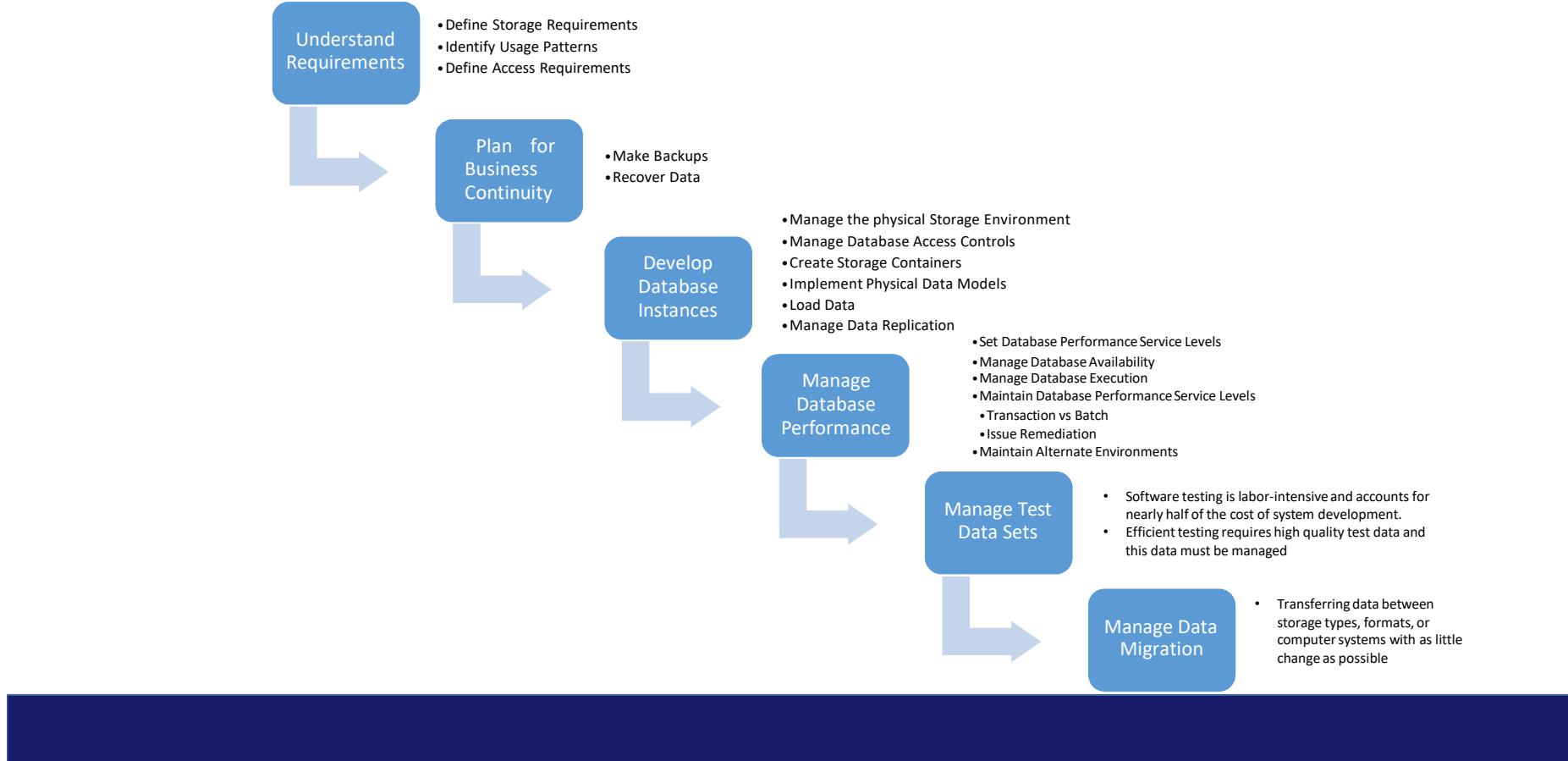
Sharding

Small chunks of the database are isolated and can be updated independently of other shards
Replication is a file copy

Manage Database Technology



Manage Databases



Tools

Data Modeling Tools

Automate many of the tasks for the data modeler

- Generate DDL
- Reverse Engineering
- Validate Naming Standard and Check Spelling
- Store Metadata
- Enable publishing to web

Database Monitoring Tools

Monitor key metrics, Alerts for Issues

- Capacity
- Availability
- Cache performance
- User stats etc.

Database Management Tools

Support the management of multiple databases

- Configuration
- Installation of patches and upgrades
- Backup and restore
- Database cloning
- Test management
- Data clean-up routines

Developer Support Tools

Visual interface for connecting to and executing commands on a databases

- Some are included with database management software
- Others include Third Party applications

Techniques

Test in Lower Environments

- Install and test on the lowest level environment first

Physical Naming Standards

- Speeds to understanding semantic of data
- Representation of data
- Registry of descriptions

Script Usage for all Changes

- It is risky to directly change data in a database, it is helpful to place changes to be made into update script files and test them in non-prod before applying to prod.

Implementation Guidelines

Readiness Assessment/ Risk Assessment

Two Central Ideas:

- Data Loss – caused by technical or procedural errors or malicious intent
- Technology Readiness – Awareness of the skills needed to take advantage of new technologies

Organization and Cultural Change

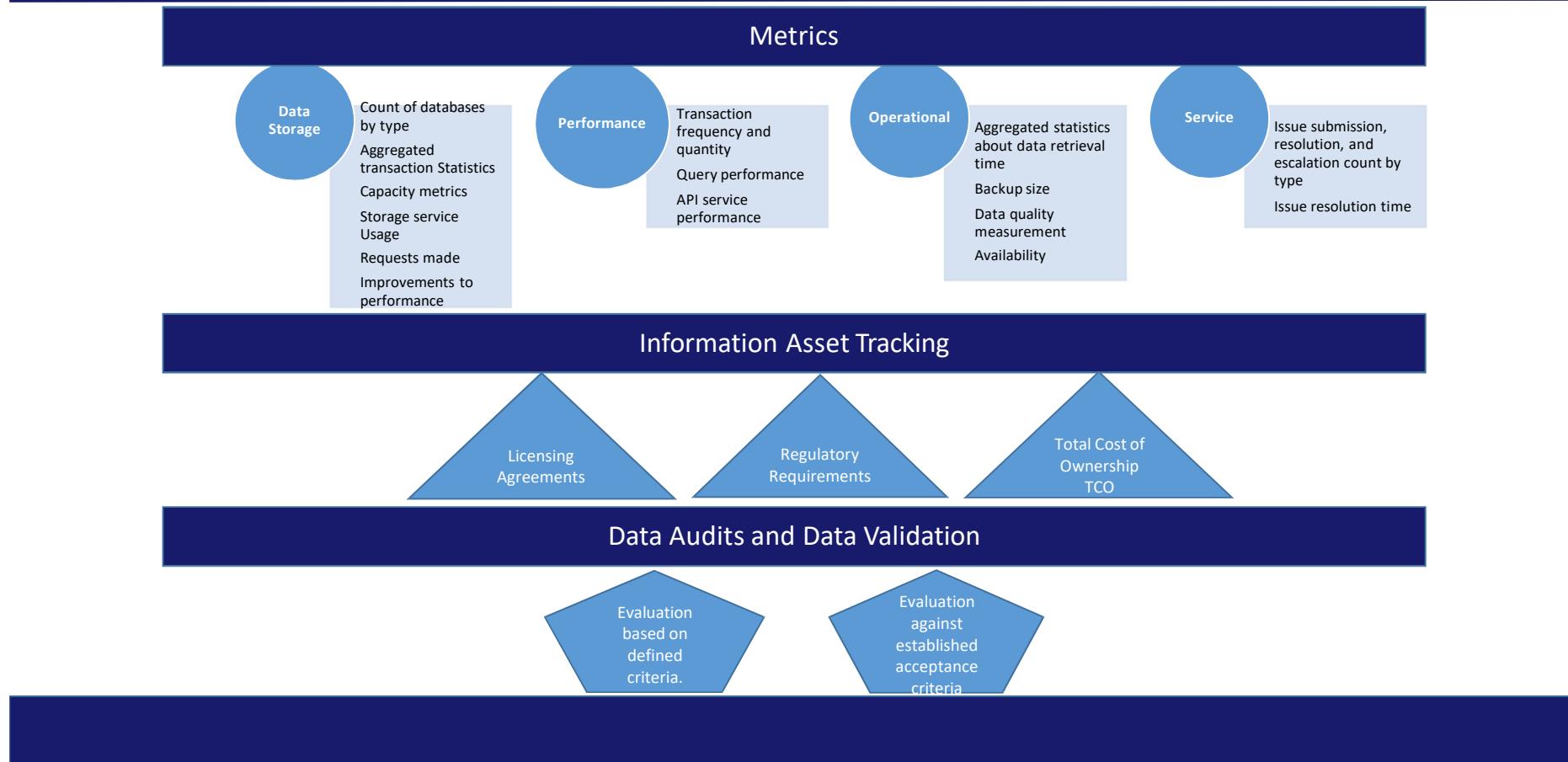
Promote the value of the work

- Abstract set of principles and practices
- Disregard human elements involved
- Clashes in frames of reference
- Application centric
- Lack of partnership with application Development



- Proactive communication
- Bring the conversation down to their level
- Stay business focused
- Be helpful
- Learn continually
- Support a service oriented application architecture

Governance



Q & A



NEXT SESSION

| Topic |
|--|
| Chapter 1: Data Management |
| Chapter 2: Data Handling Ethics |
| Chapter 3: Data Governance |
| Chapter 4: Data Architecture |
| Chapter 6: Data Storage & Operations |
| Chapter 5: Data Modeling & Design |
| Chapter 7: Data Security |
| Chapter 8: Data Integration & Interoperability |
| Chapter 9: Document & Content Management |
| Chapter 10: Reference & Master Data |
| Chapter 11: Data Warehousing & Business Intelligence |
| Chapter 12: Metadata Management |
| Enjoy your summer |
| Chapter 13: Data Quality |
| Chapter 14: Big Data & Data Science |
| Chapter 15: Data Management Maturity Assessment |
| Chapter 16: Data Management Organization & Role Expectations |
| Chapter 17: Data Management & Organizational Change Management |
| Final Review |



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HOMEWORK

Data Modeling & Design (For Discussion)

What are the strongest business drivers for data modeling?



Part 7: Data Security

AGENDA

- Facilitator Introduction
- Introductory Note
- Chapter 7: Data Security
 - Thinking about Chapter 7
 - Overview of the chapter
 - Sample questions (not real ones, just ones I would ask)
- Q & A / Discussion

Thinking about Chapter 7: Data Security

- **Chapter contains a densely packed, specialized vocabulary:**
 - Will not review the vocabulary separately
 - Learn it by going through the other materials
 - Come back to the vocabulary through sample questions
- **Approach:**
 - Data Security definition
 - Stakeholders, goals, drivers, and principles
 - Activities
 - Tools
- **What I won't cover:**
 - Details about regulations. *You should study these. They are important and described in several chapters in the DMBOK2.*
- **Before we start:**
 - Why it is important to know about data security
 - What I like about this chapter
 - How I would study



Why Data Security Matters: Data can be misused

The New York Times

Cyberattack Forces a Shutdown of a Top U.S. Pipeline

The operator, Colonial Pipeline, said it had halted systems for its 5,500 miles of pipeline after being hit by a ransomware attack.

Cyber attack 'most significant on Irish state'

BBC | NEWS

A cyber attack on Irish health service computer systems is "possibly the most significant cybercrime attack on the Irish state", a minister has said.

Speaking on broadcaster RTÉ, Ossian Smyth said the attack "goes right to the core of the [health] system".

However, he also said that it was "not espionage".

Taoiseach (Irish PM) Micheál Martin said that he had consulted with cybersecurity experts and that the state would not be paying a ransom.

He said it would "take some days" to assess its impact.

"What's important is people cooperate with the HSE," he said, and added that emergency services remain open, and the vaccine programme continues uninterrupted.

An official website of the United States government. [Here's how you know](#) ▾

MORE ▾

FBI

Q Search

WHAT WE INVESTIGATE

Terrorism | Counterintelligence | Cyber Crime | Public Corruption | ▾ More

Results: 1750 Items

Press Release

Oregon FBI Tech Tuesday: Building a Digital Defense Against COVID-19 Funeral Fraud

May 18, 2021

[Read More](#)

Press Release

FBI Detroit Partners with Chaldean Community Foundation to Warn the Community About the Dangers of Sextortion

May 17, 2021

[Read More](#)

Press Release

Nigerian Citizen Charged with Defrauding Washington State Employment Security Department of More Than \$350,000

225

May 17, 2021

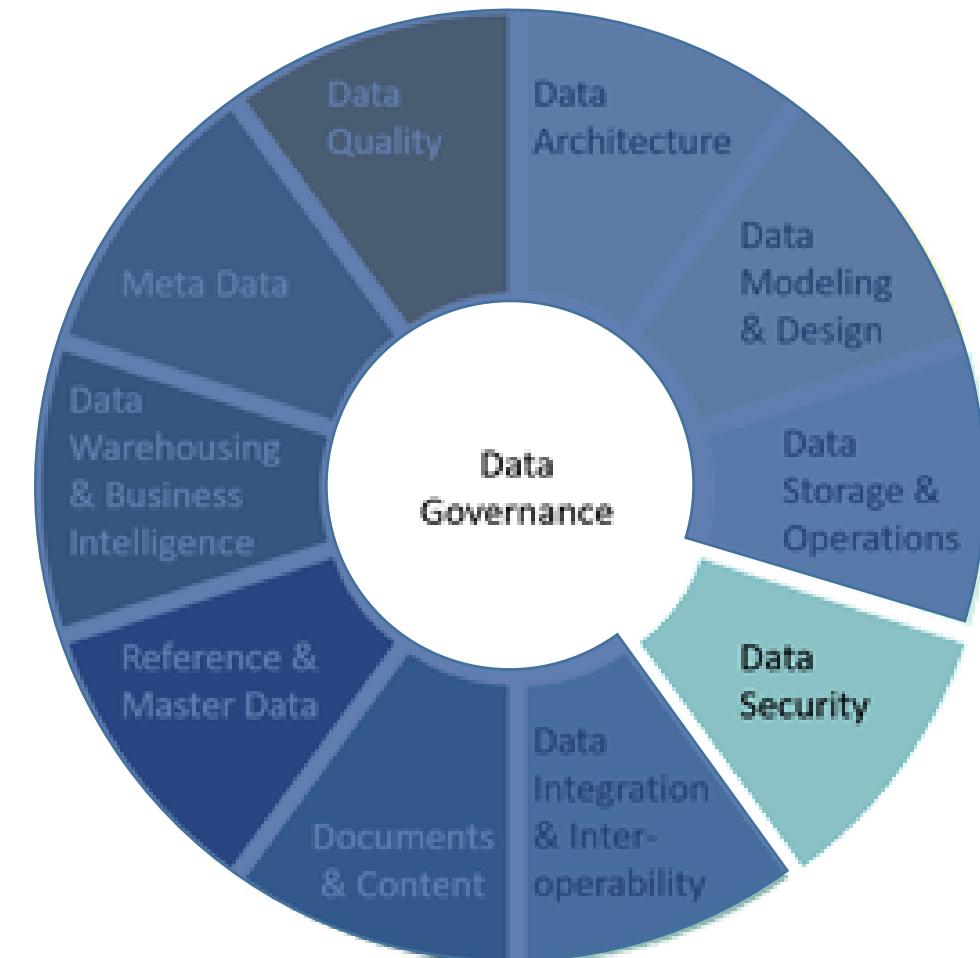
Chapter 7: Data Security Definition & Goals

Data Security ensures that data privacy and confidentiality are maintained, that data is not breached, and that data is accessed appropriately.

Data Security includes the planning, development, and execution of security policies and procedures to provide proper authentication, authorization, access, and auditing of data and information assets.

Goals of Data Security:

- Enable appropriate access to enterprise data assets
- Prevent inappropriate access to enterprise data assets
- Understand and comply with relevant regulations and policies for privacy, protection, and confidentiality.
- Ensure that the privacy and confidentiality needs of all stakeholders are enforced and audited.



Chapter 7: Data Security Goals & Stakeholders

Common Goal for data security across industries:

To protect information assets in alignment with privacy and confidentiality regulations, contractual agreements, and business requirements.

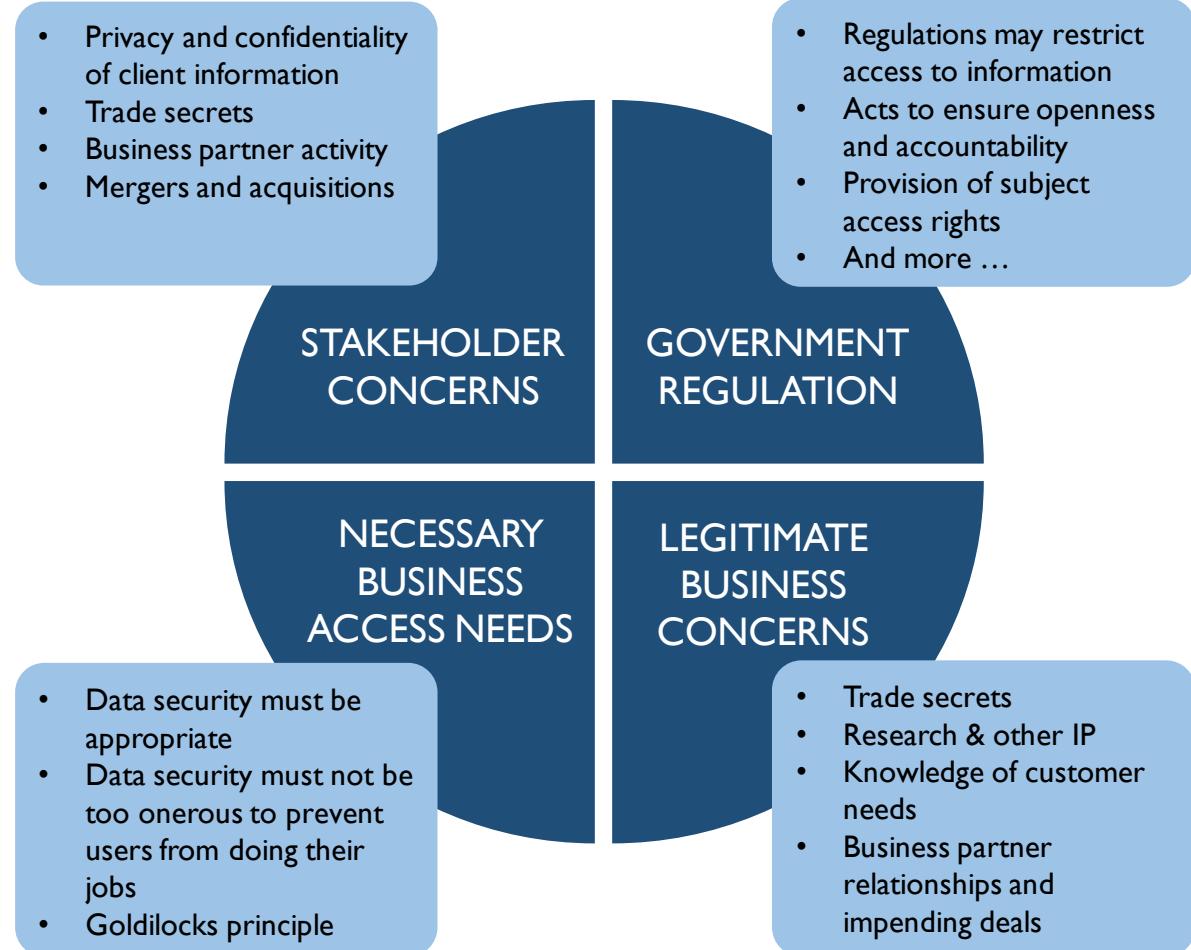
Specific requirements come from

- Stakeholders
- Regulations
- Business concerns
- Access needs
- Contractual obligations

Secure data is in the best interests of all stakeholders.

Study this diagram, and you will know a lot about data security.

Sources Of Data Security Requirements

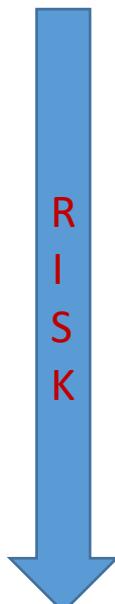


© DAMA International, 2017

Chapter 7: Data Security Business Drivers

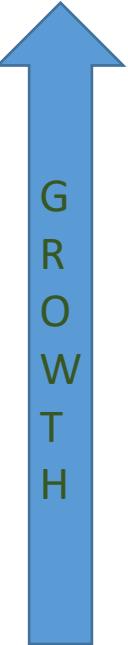
Risk Reduction

- Legal and moral responsibility to stakeholders
- Potential reputational impact of breaches
- Activities include
 - Locate and classify data
 - Understand how data is used
 - Assess threats
- Take an enterprise approach



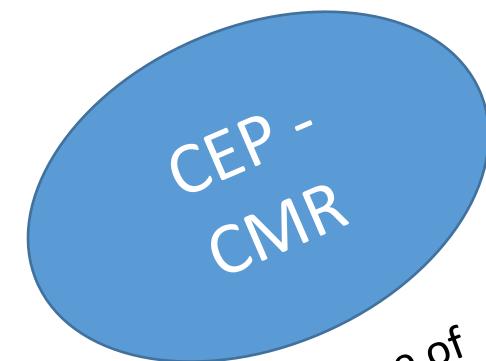
Business Growth / Competitive advantage

- Security enables transactions and builds customer confidence
- Security-related Metadata as a strategic asset
 - Increased the quality of transactions, reporting, and business analysis
 - Reduces the cost of protection and associated risks that lost or stolen information cause



Chapter 7: Data Security Principles

- **Collaboration:** IT security administrators, data stewards/data governance, internal and external audit teams, and the legal department.
- **Enterprise approach:** Apply standards and policies consistently across the entire organization.
- **Proactive management:** Engage all stakeholders, manage change, and overcome organizational bottlenecks such as traditional separation of responsibilities between information security, information technology, data administration, and business stakeholders.
- **Clear accountability:** Define roles and responsibilities, including the ‘chain of custody’ for data across organizations and roles.
- **Metadata-driven:** Security classification for data elements is an essential part of data definitions.
- **Reduce risk by reducing exposure:** Minimize sensitive/confidential data proliferation, especially to non-production environments.

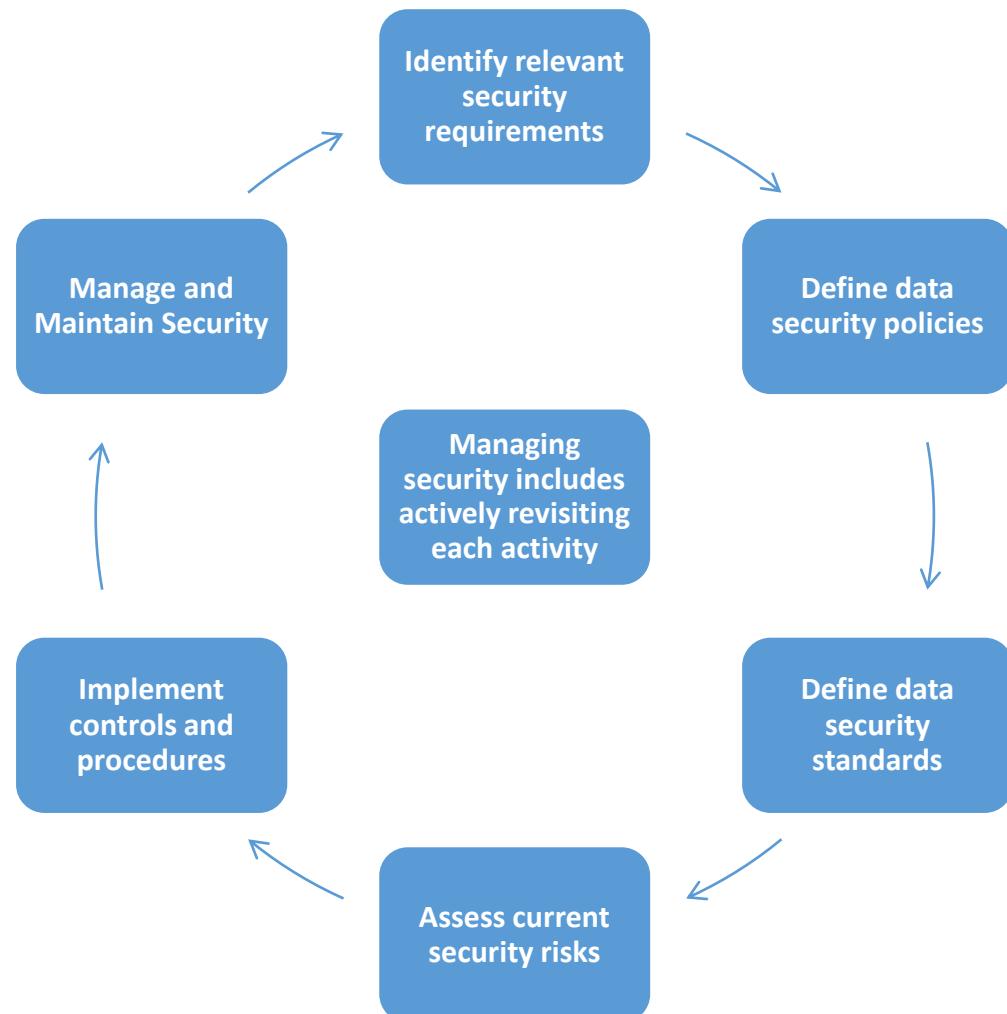


Sounds like the name of a Welsh Railway, but it's really an acronym to remember these principles

Chapter 7: Data Security Activities

- **Identify relevant security requirements:**
 - Business requirements to meet mission
 - Industry specific regulation
 - Know how regulation impacts your business
- **Define data security policies:**
 - Describe behaviors your organization needs to adopt to protect its data.
 - Policies must be auditable and audited.
 - Policies have legal implications.
 - Policies at different levels (Enterprise, IT, Data) cover different facets of security
- **Define data security standards:**
 - Standards supplement policies with detail on how to meet the intention of the policies. For example:
 - Data confidentiality levels
 - Data regulatory categories
 - Security roles
- **Assess current security risks:**
 - Sensitivity of the data stored or in transit
 - Requirements to protect that data
 - Existing security controls
- **Implement controls and procedures**
 - How users gain and lose access to systems and/or applications
 - How users are assigned to and removed from roles
 - How privilege levels are monitored
 - How requests for access changes are handled and monitored
 - How data is classified according to confidentiality and applicable regulations
 - How data breaches are handled once detected
- **Manage and Maintain Security**
 - See next slide

Chapter 7: Data Security Activities



Manage and Maintain Security

- Ensure that security breaches do not occur
 - Detect them as soon as possible
 - Monitor systems
 - Audit compliance with policies and standards
- Control Data Availability / Data-centric Security
 - Manage entitlements
 - Ensure technical controls are used
- Monitor User Authentication and Access Behavior
 - Know who is accessing which data assets
 - Automate. Lack of automation = RISK
- Manage Security Policy Compliance:
 - Manage regulatory compliance – Compliance must be measurable and auditable
 - Audit Data Security and Compliance Activities
 - Audits must be independent
 - Audits are not fault-finding missions

Chapter 7: Data Security Tools, Techniques, Metrics

TOOLS

- Anti-Virus Software / Security Software
- HTTPS
- Identity Management Technology
- Intrusion Detection and Prevention Software
- Firewalls (Prevention)
- Metadata Tracking
- Masking / Encryption: Hash, Private-Key, Public-Key, Masking

TECHNIQUES

- CRUD Matrix Usage
- Immediate Security Patch Deployment
- Data Security Attributes in Metadata

METRICS

- Security Implementation: employees who have scored more than 80% on annual security practices quiz; percent of business units with formal risk assessment analysis
- Security Awareness: Risk assessment profiles, Surveys and interviews
- Data Protection Metrics: Vulnerability assessments, threat assessments
- Security Incident Metrics: Intrusion attempts detected, cost savings for prevented intrusions
- Confidential Data Proliferation: Number of copies of sensitive data

Chapter 7: Learning the Lingo

| TERM | DEFINITION | EXAMPLE |
|---------------|---|---|
| Vulnerability | weaknesses or defect in a system that allows it to be successfully attacked and compromised | Out-of-date security patches, untrained employees |
| Threat | a potential offensive action; internal or external, not always malicious | untrained employees, virus-infected email |
| Risk | the possibility of loss and to the thing or condition that poses the potential loss | A threat or a vulnerability |

Chapter 7: Prep Questions

Which of the following does NOT contribute to risk reduction?

- A. Identify how sensitive data is used in business processes
- B. Locate sensitive data assets in the organizations
- C. Establish default passwords
- D. Determine how each asset should be protected
- E. Identify and classify sensitive data assets

Having default passwords creates system risk. P 241

Risks related to each threat can be calculated based on

- A. The likelihood of their occurrence
- B. The amount of damage each occurrence might cause
- C. Their effects on business operations
- D. The cost to prevent them
- E. All of the above

All of these can help you calculate risk. P. 223

Chapter 7: Learning the Lingo

| TERM | CLASSIFICATION SCHEMA | CLASSIFICATION LOGIC |
|---------------------------------|--|--|
| Risk Classifications | Critical Risk Data High Risk Data Moderate Risk Data | Based on how actively sought after the data may be; potential for financial gain |
| Regulatory Classifications | Personal Identification Info (PII) Financially Sensitive Data Medically Sensitive Data (PHI) Educational Records Credit Card Data, Trade Secrets, Contractual Restrictions | Allowed-to-know: The ways in which data can be shared are governed by the details of the regulation. |
| Confidentiality Classifications | General audience Internal use Confidential Restricted Confidential Registered Confidential | Need-to-know: Levels of confidentiality depend on who needs to know certain kinds of information. |

Chapter 7: Prep Questions

The Payment Card Industry Data Security Standard is an example of

- A. A regulatory family
- B. A contractual security standard
- C. Financially sensitive data
- D. An industry security standard

See the list of industry or contract-based regulation, p. 237

The Four A's include Access, Audit, Authentication, Authorization. They represent:

- A. Ways to monitor security
- B. Responsibilities of individual users
- C. Security procedures and requirements classifications
- D. Functions of a security organization

For definitions of the Four A's and an E, see p. 225

Chapter 7: Learning the Lingo

| TERM | DEFINITION | EXAMPLES |
|-----------------------|--|--|
| Malware | any malicious software created to damage, change, or improperly access a computer or network | Virus Trojan Horse Adware Worm |
| Social Threat | communications designed to trick people who have access to protected data into providing that information to access data | Phishing Social engineering |
| Security System Risks | elements that can compromise a network or database, or allow legitimate employees to misuse information, and enable malicious hacker success | Abuse or elevation of privilege Shared accounts Platform intrusion SQL Injection Default passwords |

Chapter 7: Prep Q

System Security Risks include all of the following, except:

- A. Phishing
- B. Abuse of privilege
- C. Shared accounts
- D. Platform intrusion
- E. Hacking

The focus on this question is risk assessment. The other answers are important to data security, but not directly connected to risk assessment.
p. 251

This is an example of a Social Threat p. 242

Security risks can be assessed based on:

- A. How confidentiality levels, regulatory families, and industry needs are set
- B. How users gain access to the system and how access is monitored
- C. Existing security roles, hierarchies, and access rights
- D. Data sensitivity, protection requirements, and current practices

Discussion / Q&A: How to study Data Security



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| Chapter 17: Data Management & Organizational Change Management |
| Final Review |

Dates and order of delivery are
subject to change!
Check the web site.
<https://damanewengland.org/>



HOMEWORK – Data Integration & Interoperability

What the heck is orchestration, and why is it so darned important?