TDWI Business Intelligence and Analytics Architecture

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TDWI strives to provide course books that are content-rich and that serve as useful reference documents after a class has ended.

This preview shows selected pages that are representative of the entire course book; pages are not consecutive. The page numbers shown at the bottom of each page indicate their actual position in the course book. All table-of-contents pages are included to illustrate all of the topics covered by the course.

TABLE OF CONTENTS

COURSE OBJECTIVES

You will learn:

- ✓ ***The full scope of architectural objectives—structural integrity, standardization, reusability, environmental fit, aesthetics, and sustainability***
- ✓ ***A framework to ensure overall architectural completeness and success—business purpose, organization, data and integration, process, and technology platforms***
- ✓ ***A framework for business architecture—performance, stakeholders, processes, rules, and information***
- ✓ ***A framework for organization architecture—people, purpose, process, and structure***
- ✓ ***A framework for data and integration architecture—collection, storage, operational data integration, data warehousing, big data integration, distribution/access/applications, and data modeling/metadata management***
- ✓ ***A framework for process architecture—methodologies, data governance, data modeling/metadata management, data flow, business processes, and operations/support***
- ✓ ***A framework for technology architecture—servers, data sourcing, databases, storage, data integration, business analytics, and data management***

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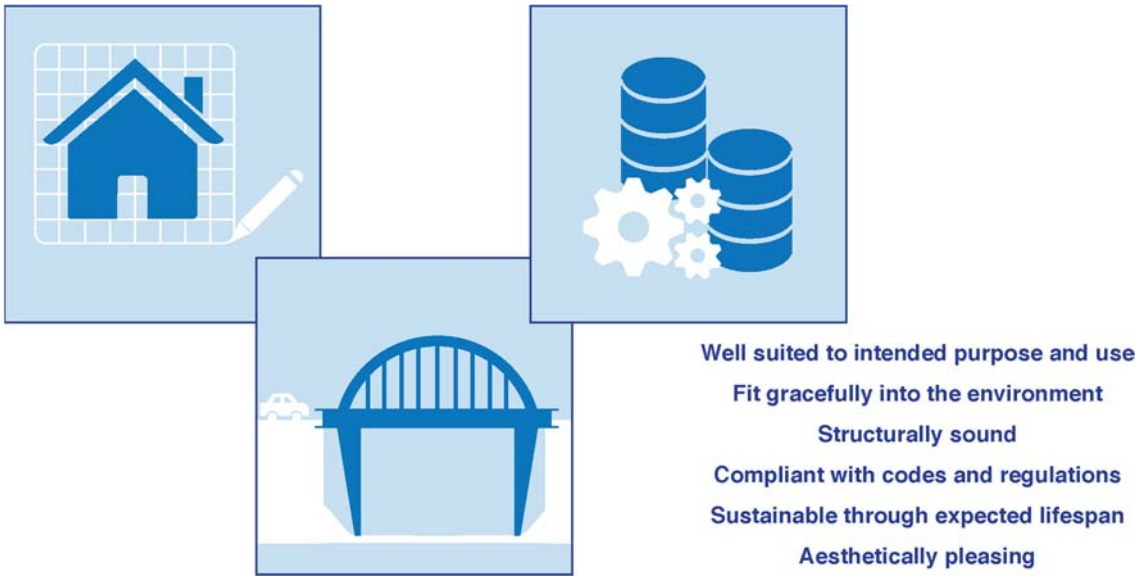
Module 1

Business Intelligence and Analytics Architecture Concepts

Architecture Defined

What Is Architecture?



Architecture Defined

What Is Architecture?

DEFINITION

Architecture defines the roles, structure, relationships, and rules by which a collection of components constitute a cohesive whole—the glue that bonds individual parts into a system. Architecture is an early-stage design activity that precedes detailed design, specification, and construction.

ROLES OF ARCHITECTURE

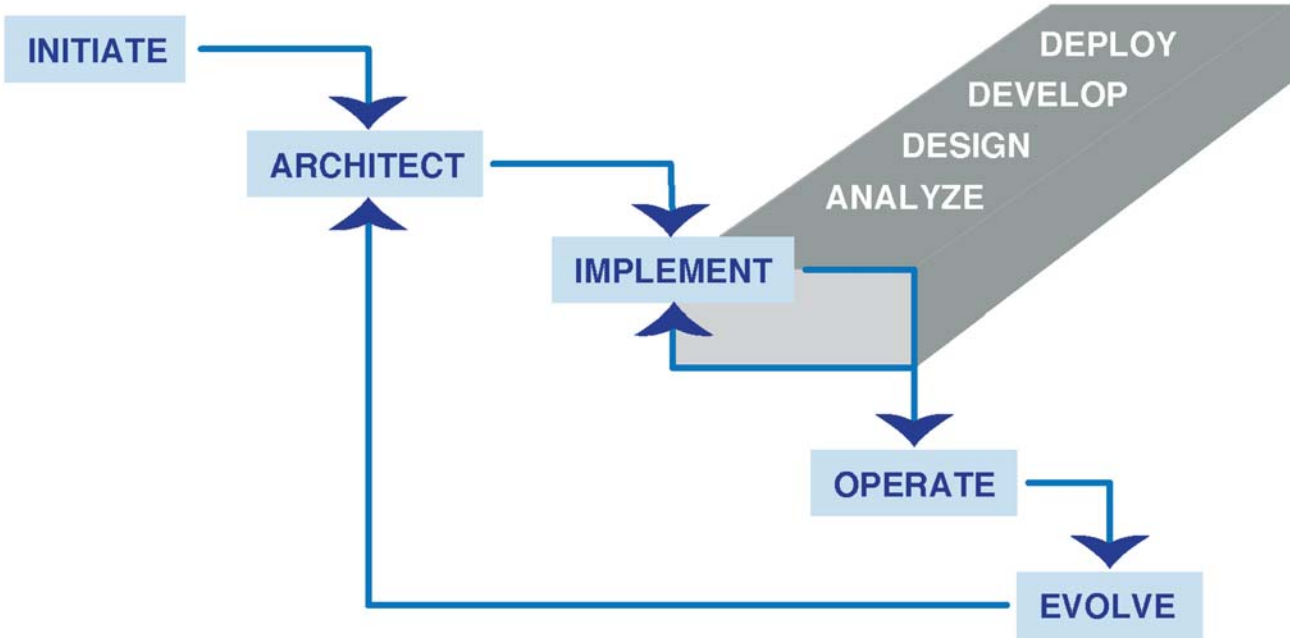
Effective architecture ensures that the things we build:

- Are suited to the purposes for which they are intended
- Fit gracefully into their environment
- Are structurally sound
- Comply with codes, regulations, and standards
- Are sustainable through their expected lifespan
- Are aesthetically pleasing

These principles hold true for architecture of many things—buildings, bridges, information systems, and more.

Architecture in the BI and Analytics Lifecycle

Iterative Implementation



Architecture in the BI and Analytics Lifecycle

Iterative Implementation

BI AND ANALYTICS PROGRAMS

BI and analytics solutions are developed as part of programs that balance business needs with available resources and materials.

Implementations take place within a larger lifecycle framework that evolves over time. This diagram depicts typical phases of the BI and analytics development lifecycle. Note the position of the architecture stage.

INITIATION

Every BI and analytics program begins with activities that establish the charter, sponsorship, initial funding, and expectations.

ARCHITECTURE

Definition of architecture typically follows initiation. Architecture identifies the components of solutions—data, information, technology, process, project, and organization—and establishes standards and guidelines for implementation and operation.

IMPLEMENTATION

Implementation projects are the development activities of BI and data warehousing (DW) programs. Typically executed iteratively as a series of small, short duration projects, this step delivers the databases, data warehouses, data transformation processes, data and information services, analytics applications, and technology deployments necessary to make BI a reality.

OPERATION

Operation encompasses administration of and delivery of information services through BI/DW solutions. Day-to-day operation of the data warehouse and delivery of information and analytics services are abundant with opportunities to recognize and even anticipate change.

EVOLUTION

Throughout the operational life of the BI program it is necessary to continuously align with changing business requirements. Recognizing need for change drives evolution, closing the lifecycle loop by returning to the architecture phase.

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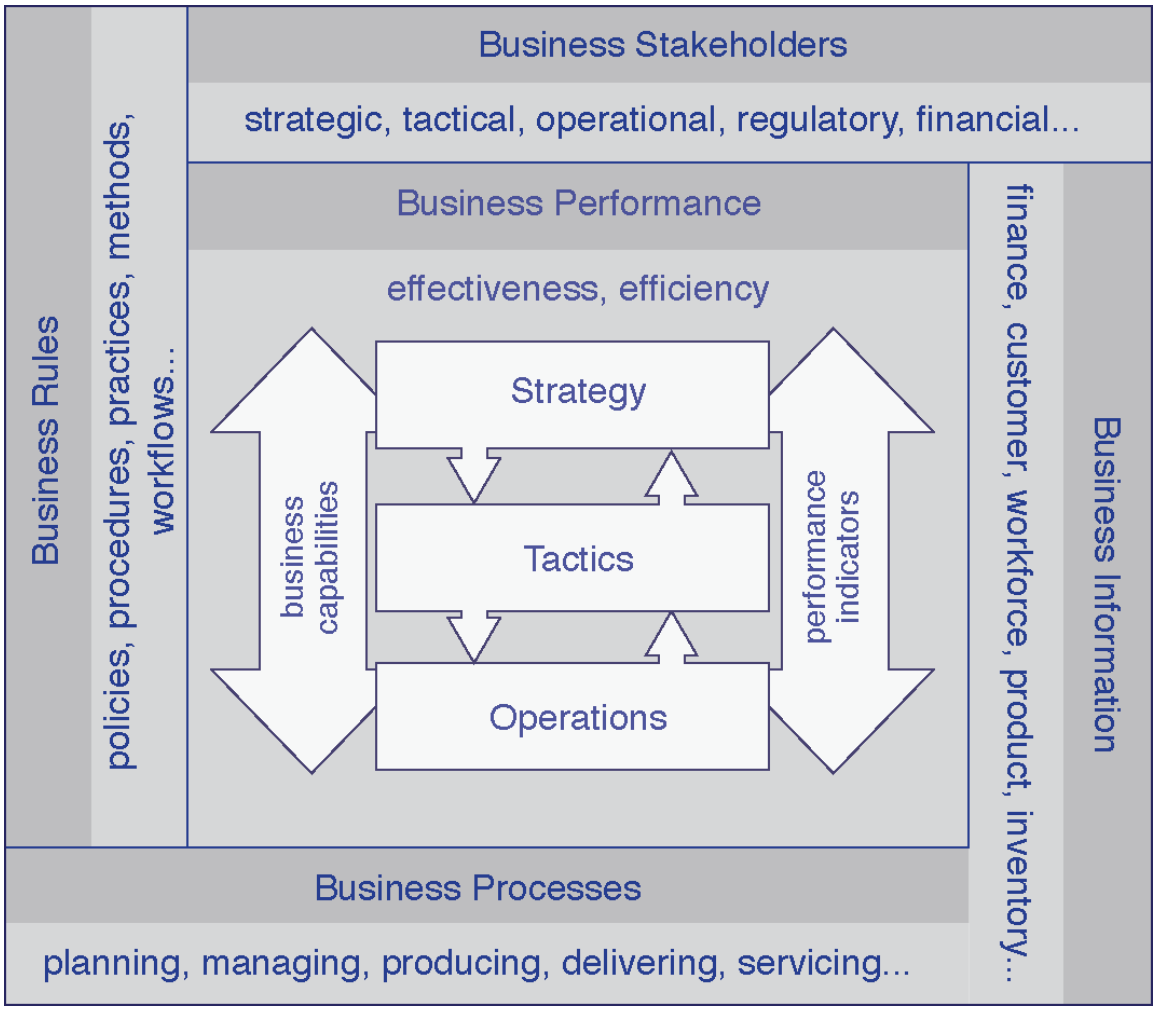
Module 2

Architecting Business Capabilities

Business Architecture Concepts

Framework for Business Architecture



Business Architecture Concepts

Framework for Business Architecture

THE TOP OF THE STACK

Business architecture is the essential starting point for BI and analytics architecture. Without the right business focus, it makes little difference how well you organize or structure data, integration, and processing. When a BI program gives more attention to dashboards, scorecards, OLAP, reports, and data warehouses than to finance, R&D, marketing, operations, and customer support it is difficult to create real business value.

BUSINESS PERFORMANCE

Business performance is the core of business architecture. Business analytics and intelligence delivers value when it makes substantial contributions to business effectiveness and efficiency. Three primary ways that BI contributes are:

- Enabling new capabilities for business planning, management, and execution
- Creating feedback loops between strategy and tactics and between tactics and operations
- Formalizing the definition, measurement, and tracking of key business performance indicators

BUSINESS STAKEHOLDERS

The human connection is an important part of BI and analytics. Identifying and classifying stakeholders is an architectural construct. Multiple classifications such as by role (strategic, tactical, operational) and by interest (legal, regulatory, financial) are useful to fully understand the scope and relationships of stakeholders.

BUSINESS INFORMATION

Information is an obvious BI and analytics architecture topic. A primary purpose of both BI and analytics is to deliver information that makes a difference. Business architecture identifies business information subjects and relationships among them.

BUSINESS PROCESSES

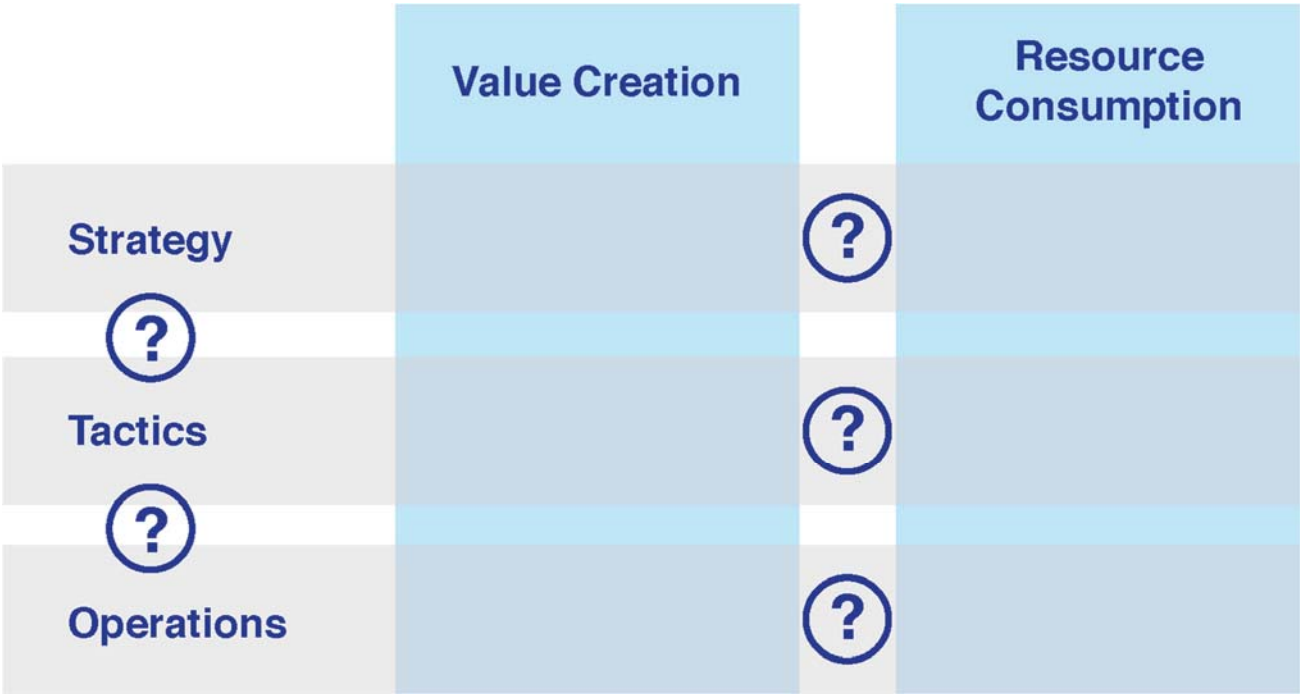
The processes of the business are among stakeholder interests and responsibilities, and they are also sources for and consumers of information. No business architecture is complete without a process view.

BUSINESS RULES

The policies, procedures, practices, methods, and workflows of business express rules and constraints that must be reflected through all of the organizational, integration, data, and process components of BI and analytics. Business architecture includes the structures and relationships to incorporate business rules into BI and analytics systems.

How Business Architecture Fits In

Align Investments with Business Goals



How Business Architecture Fits In

Align Investments with Business Goals

ALIGNMENT OF INVESTMENTS

Business intelligence and analytics architecture involves investment in all levels of architecture. Architecture enables business analytics and intelligence capabilities—capabilities that align with the business goals of the organization.

Business goals are the drivers of architectural choices. Strategic, tactical, and operational goals will influence all architectural components and need to be aligned to ensure attainment of the organizational strategy.

STRATEGIC GOALS

Strategy defines a company's future position as a set of goals and the methods by which it plans to achieve those goals. For business analytics and intelligence, strategic goals might translate into new capabilities needed to address business drivers. Capabilities such as prediction, simulation, or forecasting are examples.

TACTICAL GOALS

Tactics are planned activities to progress from one milestone to the next in pursuit of strategic goals. Strategic goals influence tactical goals. Tactical business analytics and intelligence goals translate into new projects that include the delivery systems, technology, or services to support new capabilities.

OPERATIONAL GOALS

Operational goals are the day-to-day activities and business processes that carry out the work of the business. Tactical goals influence operational goals. New operational goals might include new or changed business processes. New systems, for example, can influence changes to existing business processes or create different activities to be performed.

Module 3

Architecting Organizations

Organizational Architecture Concepts

Framework for Organizational Architecture

People	Purpose
roles skills competencies capabilities	goals results responsibilities accountabilities
Process	**Structure**
decision execution communication information	reporting relationships dependencies networks

Organizational Architecture Concepts

Framework for Organizational Architecture

BI, ANALYTICS, AND THE FABRIC OF BUSINESS

Organizational structure is a term used to highlight the way a company thinks about hierarchy, assigns tasks to personnel, and ensures its workforce works collaboratively to achieve a common goal.

Organizational architecture is primarily about people. It is the essential architectural perspective that connects people with business intelligence and analytics and weaves both into the fabric of the business. Process, data, and integration struggle to create value if people don't see them as valuable and understand how they are connected with their jobs.

Organization of teams may be formal or informal. BI and analytics projects often incorporate informal reporting structures that do not map to the official organization chart.

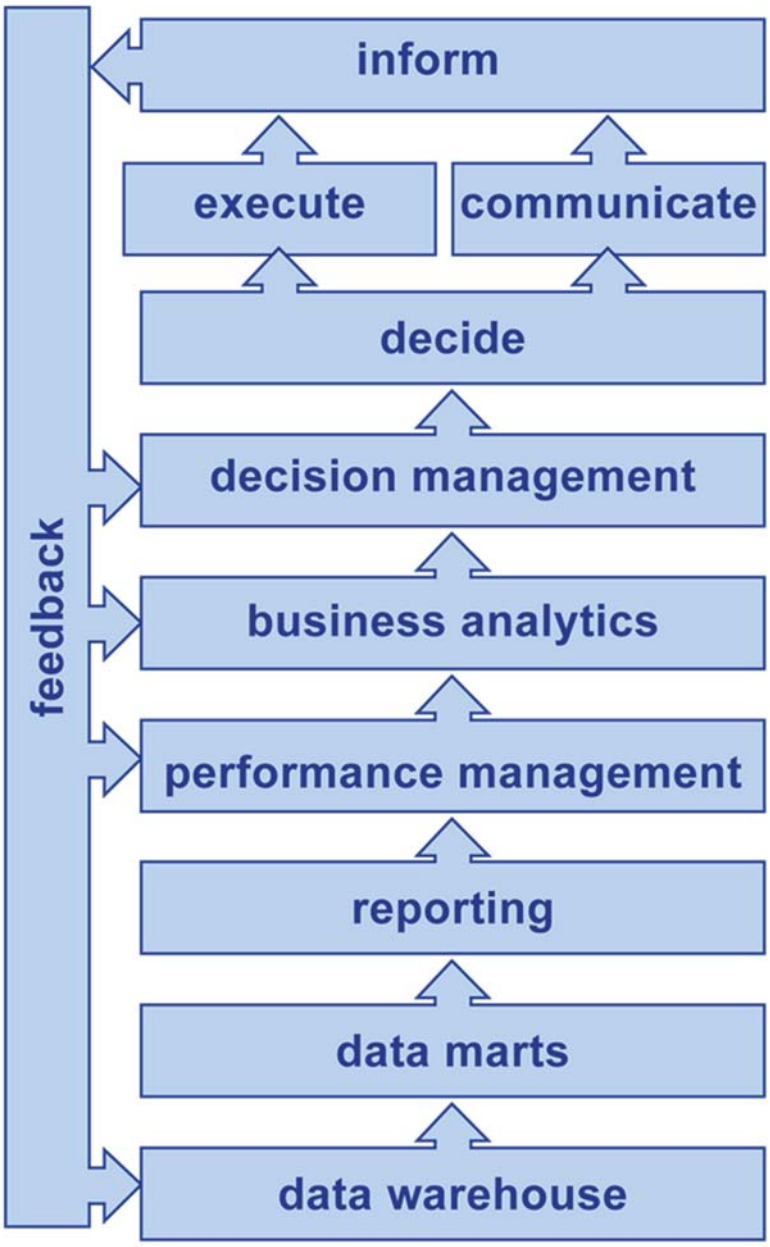
ORGANIZATIONAL FRAMEWORK

Organizational architecture consists of four categories of components:

- People—the "who" of organizations, encompassing roles, skills, competencies, and capabilities
- Purpose—the "why," including goals, results, responsibilities, and accountabilities
- Process—the "how," including decision, execution, communication, and information components
- Structure—relationships and dependencies among people

Process

Action and Information



Process

Action and Information

FEEDBACK LOOPS

The process component of organizational architecture has a strong affinity with business processes in business architecture and with the broader category of process architecture. In organizational architecture, the goal is to frame those processes that use BI and analytics services and depend on capabilities. Here the concept of decision support goes beyond decision making to encompass executing and communicating decisions and informing people and processes to create feedback loops. Feedback can advance capabilities in performance management, business analytics, and decision management. Feedback may also be reflected as new data leading to new information opportunities.

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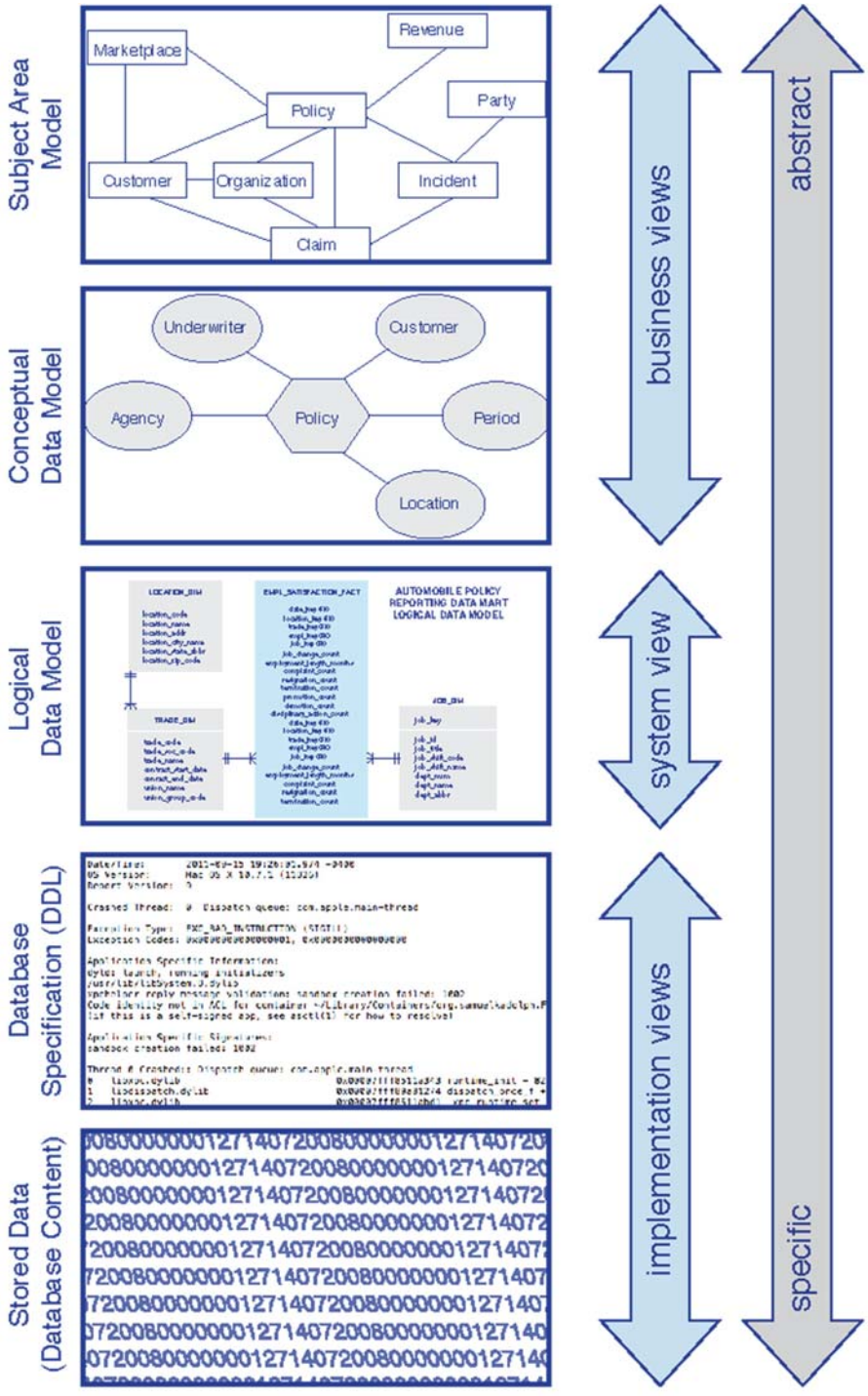
Module 4

Architecting Data and Integration

Describing Data

Data Abstraction



Describing Data

Data Abstraction

DATA MODELING

Data resources are most frequently described using data models. A data model is a representation of information used by the enterprise. Data can be represented at multiple levels of abstraction, each providing a different perspective and understanding of the data. The highest level of abstraction is a business context view with both external (outside looking in) and internal (looking from within) perspectives. This level corresponds with business activities and their associated information needs. Subsequent levels transform needs into solutions, culminating with a physical specification at the lowest level.

REMOVING DETAIL AND SPECIFICS

Data abstraction is the process of removing specifics and details from views of data. Abstraction is the opposite of specification, which increases the level of detail and specifics. Multiple levels of abstraction are used to manage the connection of data consumers with data sources:

- Business views remove the specifics of application systems and database implementation from data models and descriptions. Data is described only by its business meaning. Data models at this level are often described as conceptual, canonical, or semantic models.
- System views remove the details of database implementation from data models and descriptions. Data is described by business meaning and associated with keys and relationships that support access and navigation. Data models at this level are often called logical models.
- Implementation views capture the details of database implementation and the specifics of keys and indexing. Data is typically described in systems context rather than business meaning. Data models at this level are known as physical models.

ARCHITECTURE

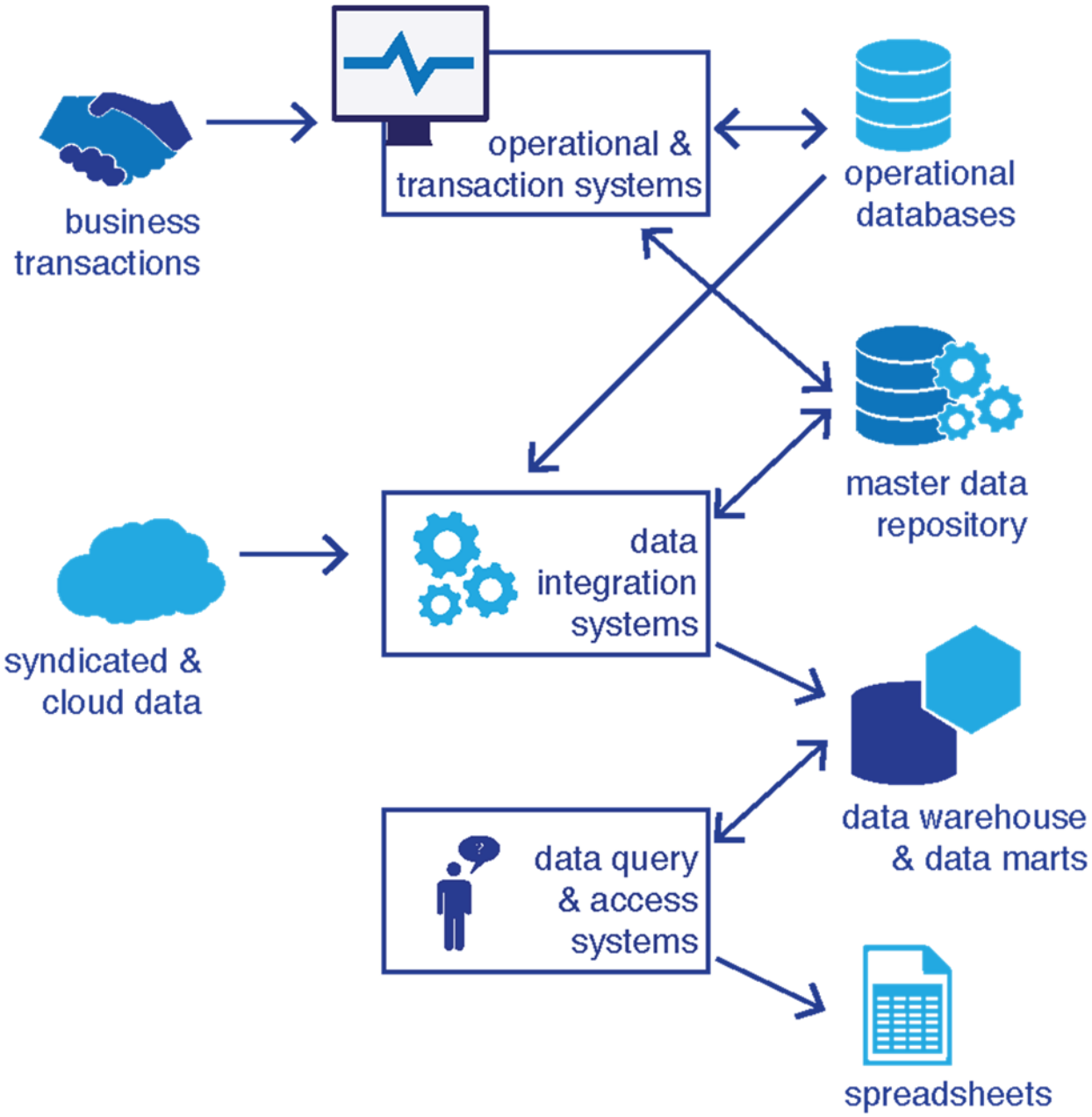
Data architecture prescribes modeling techniques and their use:

- Types of data stores and their intended use
- Modeling techniques and their role in the development lifecycle
- Data modeling standards for describing information resources

Data architecture supports business architecture and generates requirements for integration architecture.

Access and Delivery

Retrieving Data



Access and Delivery

Retrieving Data

DATA DISTRIBUTION

Data distribution prepares data for consumer access. Distribution often includes data integration and data cleansing activities and uses data stores such as warehouses and data marts. Ultimately the goal is to prepare data for access by separating it from the operational environment and representing it as schema or views that are sharable, understandable, and optimized for access.

CONSUMER ACCESS

Consumer access encompasses the activities of retrieving data, both by people and by applications, for the variety of BI uses that range from simple query to analytics and decision management. Architecture must strike the right balance between ease of access and the constraints of data privacy and security.

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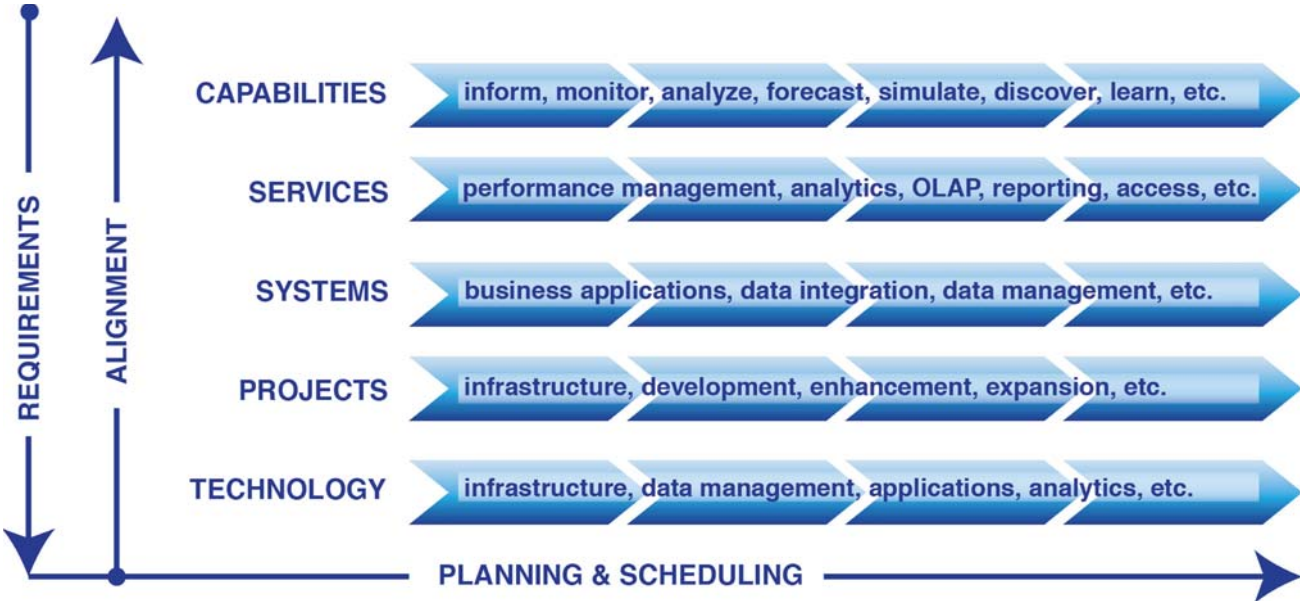
Module 5

Architecting Process

Planning

Priorities and Resources



Planning

Priorities and Resources

GOVERNANCE OF THE BI AND ANALYTICS PROGRAM

The BI and analytics lifecycle begins with planning. Planning processes determine what will be built, in what sequence, and with what resources. The process that establishes priorities and resources is the cornerstone of the process architecture. It governs the program management function.

As we saw earlier in this course, BI and analytics solutions are not developed as part of a "big bang" project with enterprise focus. Rather, they are developed in smaller pieces through increments. The project roadmap, an output of the planning process, defines and schedules the increments.

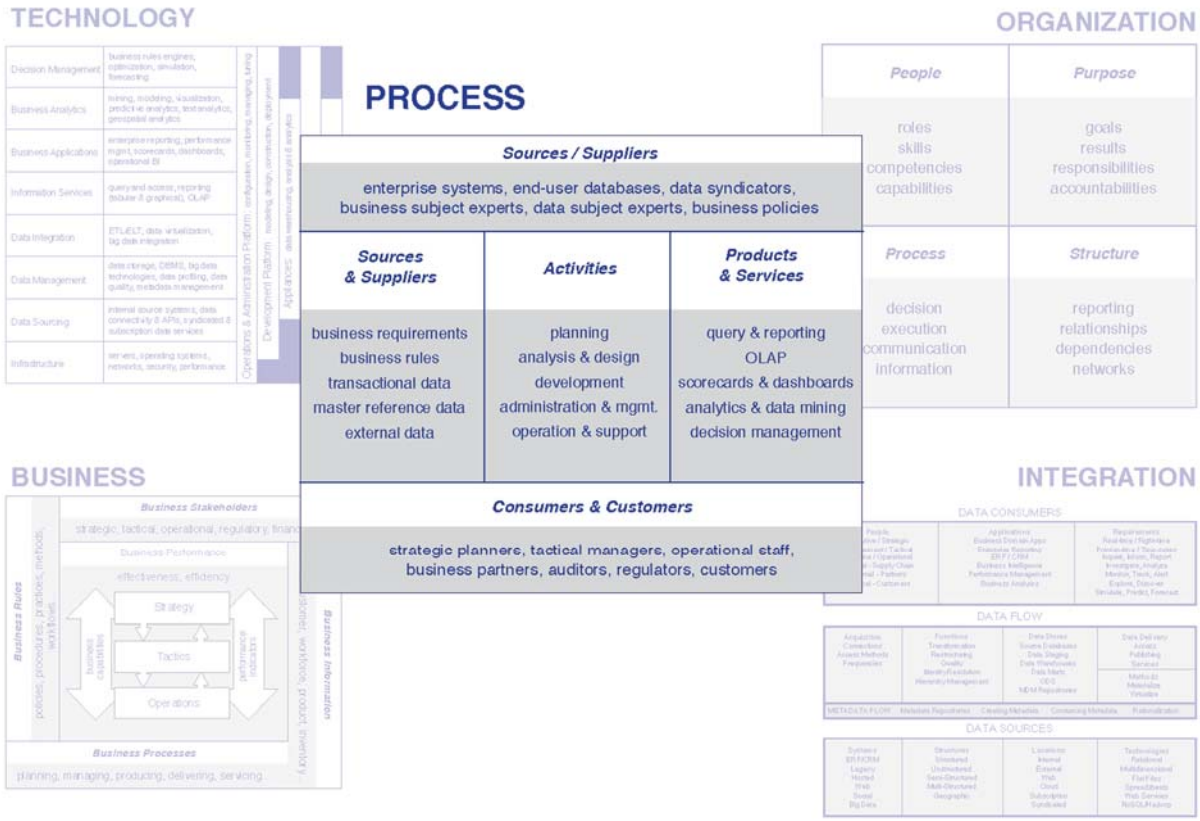
Small organizations may establish a budget and leave it to the program manager to determine priorities for development. On the opposite extreme, large organizations often feature multiple governing bodies, such as executive committees and steering committees, which follow a procedure to establish priorities and resources.

Process architecture also dictates the outputs of the planning process. Minimally, these include:

- A program roadmap
- Development schedules
- Defined scope for each project
- Budgets
- Resources for development, maintenance, and support
- A process for revising and evolving the program management function

How Process Architecture Fits In

Process Fit



How Process Architecture Fits In

Process Fit

PROCESS FIT

The process architecture enables and integrates multiple components. The integration of these components results in the ability to acquire material from sources and perform value-added activities to create products from materials, for example. Processes for BI and analytics development, use, and operations can be used across technology platforms and business groups.

This module did not dive deep into sources/suppliers, inputs/materials, and consumers as these are shared components across business, organization, integrated information, and technology architectural components.

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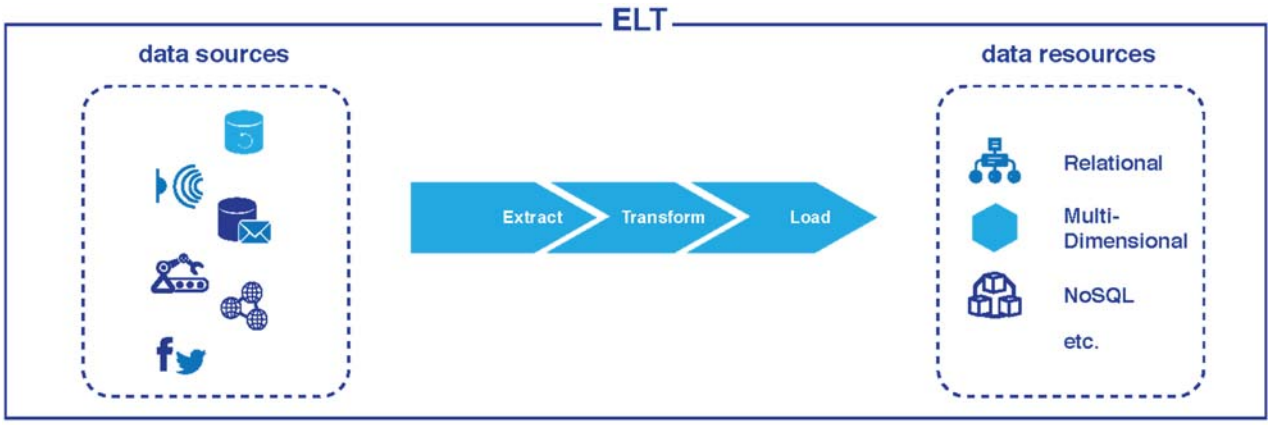
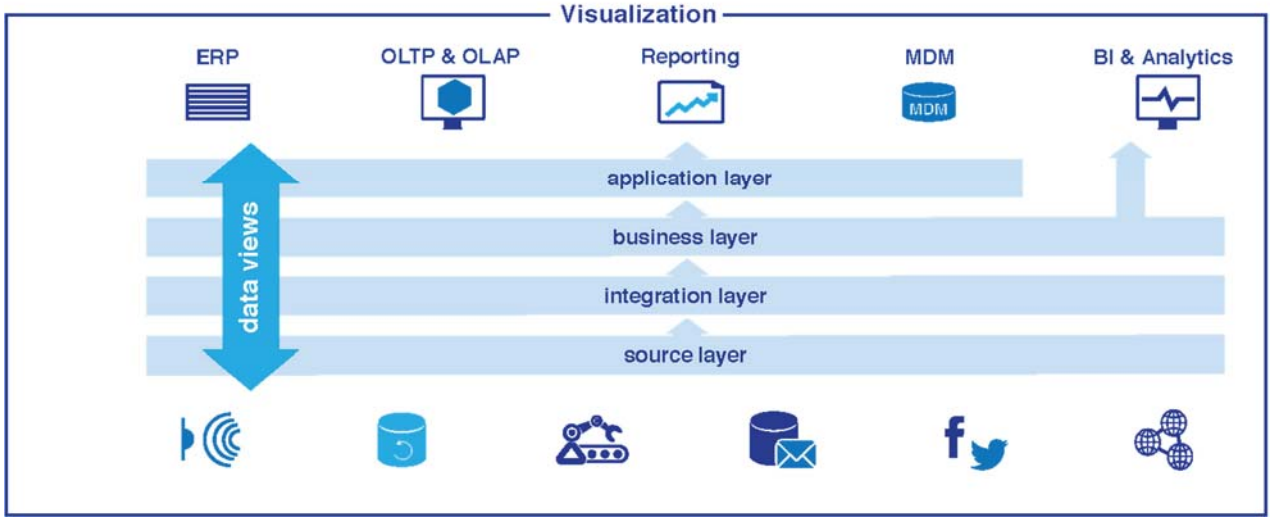
Module 6

Architecting Technology Platforms

Integration

Integration Tools





Integration

Integration Tools

INTEGRATION TOOLS

Technically, data integration can happen different ways. Acquisition, transformation, cleansing, and loading of data can occur in different sequences and using different technical approaches.

ETL AND ELT

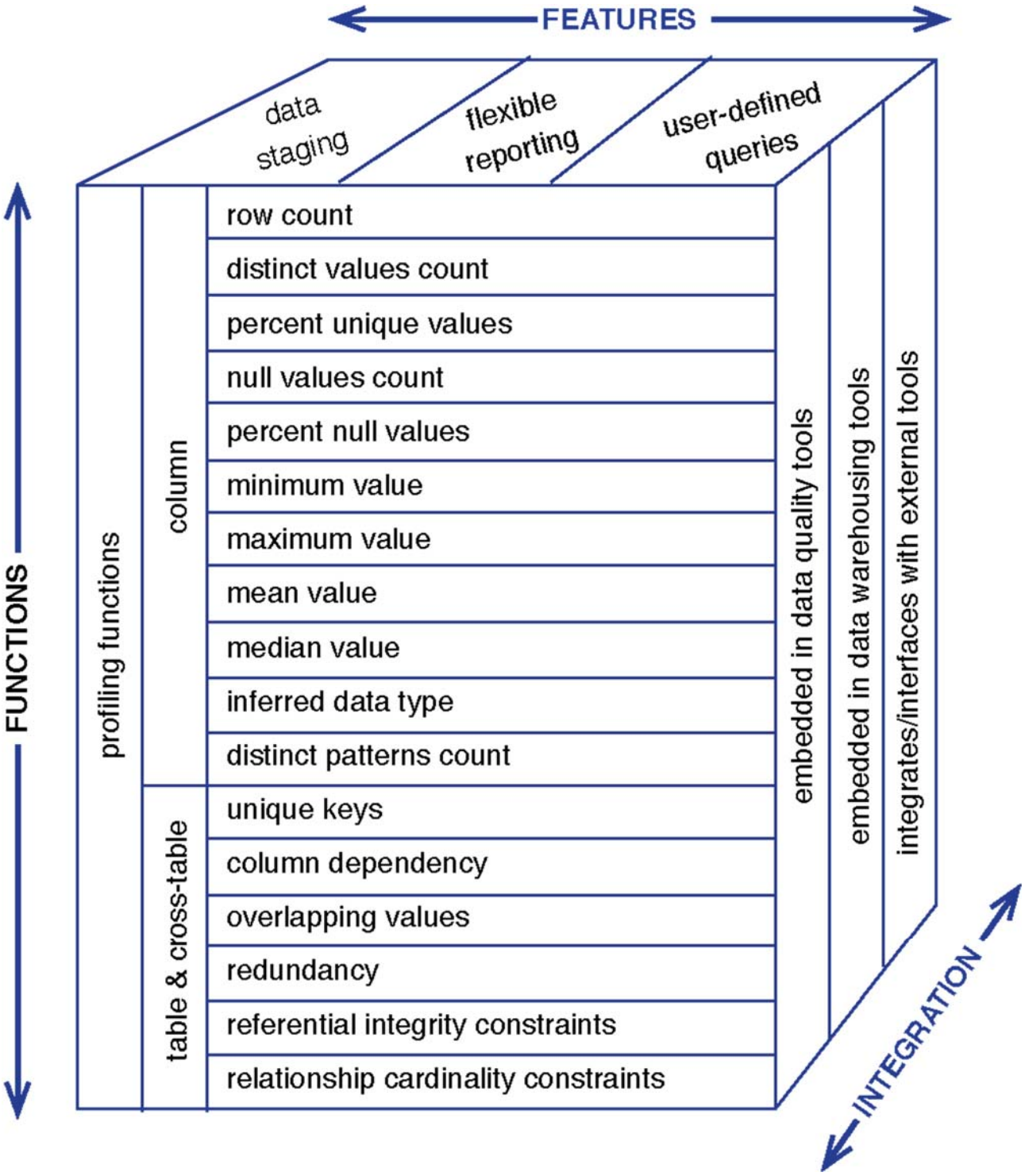
Extract, transform, and load (ETL) functionality is considered core data integration technology. ETL tools provide data acquisition, change data capture, filtering, formatting, and cleansing capabilities. ETL tools typically depict ETL flows via a graphical user interface referred to as a mapping. ETL tools typically include administration tools for scheduling and mapping administration. ETL is often associated with batch or mini-batch load frequency. ELT is a version of ETL where the focus is on data acquisition and loading first. ELT tools are architected to utilize the power of the database and complete transformation processing within the database platform.

VIRTUALIZATION

Virtualization focuses on logically integrating data at the time of the query. Advantages of virtualization include not having to physically move data for integration. Transformation and cleansing rules would be applied in the integration layer. Virtualization is a flexible option for integration especially when data is accessed less frequently.

Data Management

Profiling, Quality, Metadata, Governance



Data Management

Profiling, Quality, Metadata, Governance

QUALITY AND GOVERNANCE TOOLS

As outlined in process architecture, data governance focuses on managing data as an asset. Functions such as data profiling and metadata management contribute to data quality management and often fall under the umbrella of data governance. Suites of data quality tools exist where profiling, data quality rule management, and metadata management are part of an integrated tool. These technologies may also be provided separately or as part of data integration technology. For instance, data profiling functions and data cleansing functions may also be found in ETL tools. This is yet another category of technology to consider in the technology architecture.

