

Systems and Infrastructure Lifecycle Management

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The need for Actionable Information

- How long has Mia been a customer?
- What is Mia's annual salary?
- How much does Mia spend on a typical week?
- Where does Mia live? What is the value of her home?
- How many family members does Mia have?
- What products did Mia buy during her last visit?
- How much did Mia spend at her last visit?
- To which promotions did Mia respond?
- Did Mia spend more on her last visit or previous?
- What is Mia's 12 month spending trend?



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Chain Store Structure

- Each store maintains its own Customer and Sales records
- Hard to answer questions such as: “find the total sales of Product X from stores in Pennsylvania”
- The same customer may be viewed as different customers for different stores; hard to detect duplicate customer information
- Imprecise or missing data in the addresses of some customers
- Purchase records maintained in the operational system for limited time (e.g., 6 months); then they are deleted or archived
- The same “product” may have different prices, or different discounts in different stores
- Can you see the problems of using those data for business analysis?

Business Intelligence

Gartner:

“Business Intelligence (BI) is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance.” (<https://www.gartner.com/it-glossary/business-intelligence-bi>).

Forrester Research:

“[A] set of methodologies, processes, architectures, and technologies that leverage the output of information management processes for analysis, reporting, performance management, and information delivery. Research coverage includes executive dashboards as well as query and reporting tools.” (<https://www.forrester.com/Business-Intelligence>).

ISACA:

“Business intelligence (BI) is a broad field of IT that encompasses the collection and analysis of information to assist decision making and assess organizational performance.” (CISA Review Manual, section 3.7.18, page 199)

Business Intelligence

- Data are gathered from relevant sources
- Filtered and Stored
- Analyzed and arranged into meaningful patterns using different tools
- Business Intelligence is the knowledge gained from this analysis

Data vs. Information

	Data	Information	Knowledge	Understanding
Definition	Data is raw, unorganized facts that need to be processed. Data can be something simple and seemingly random and useless until it is organized.	When data is processed, organized, structured or presented in a given context so as to make it useful, it is called information. Who? What? When? Where?	knowledge is the appropriate collection of information, such that it's intent is to be useful. How?	It is the process by which I can take knowledge and synthesize new knowledge from the previously held knowledge. Why?
Example	It is raining.	Temperatures dropped 15 degrees and it started raining	If humidity is high and temps drop substantially it starts to rain.	We understand the interaction between humidity, temperature, evaporation,...

Transaction Process Systems

Product Database

- Add Product Line
- Change Product Price

Point of Sales

- Sales Item
- Discounts

Customer Database

- Customer Name
- Customer Address
- Club Member Number

BI driven by Analytical Processes

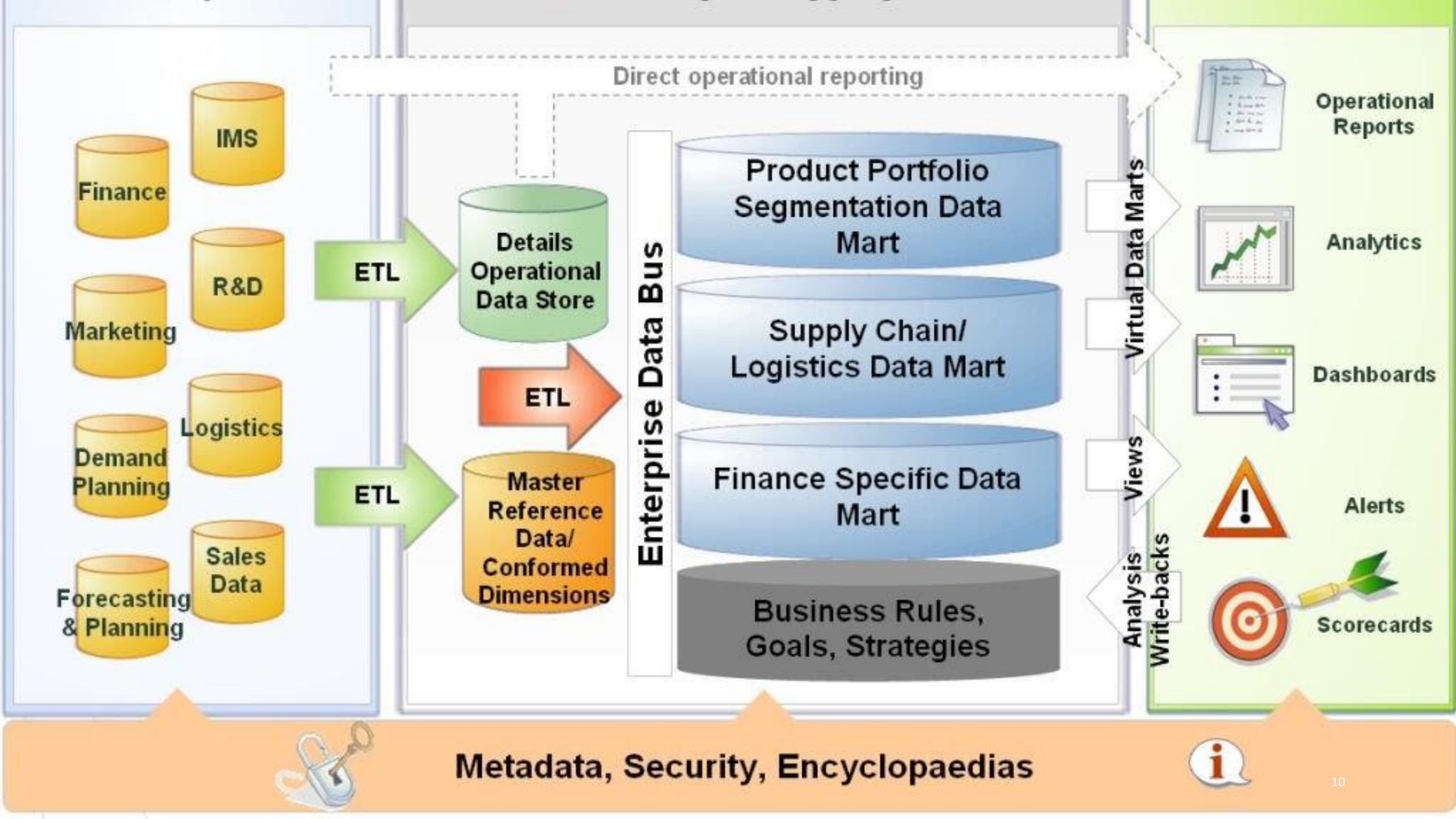


Data Warehouse

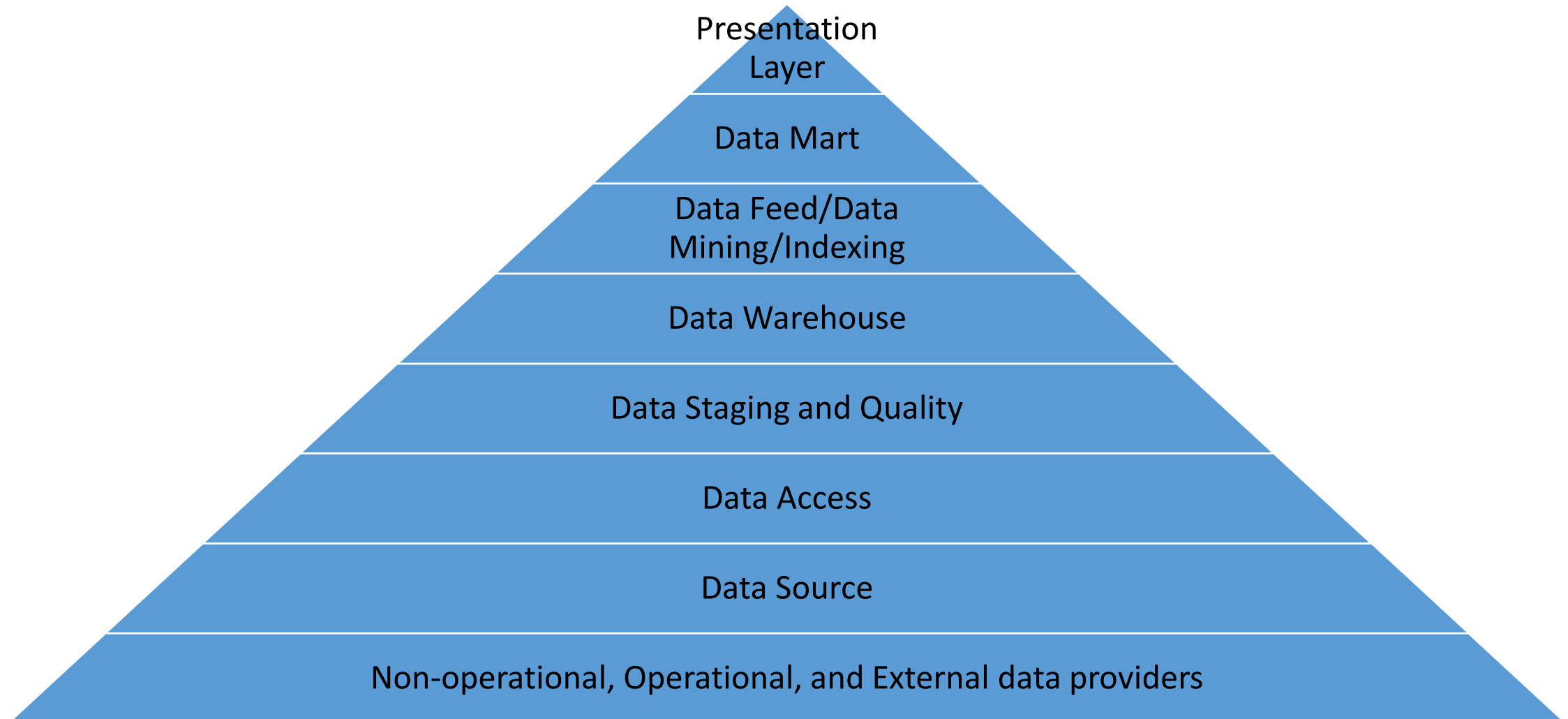
How long has Mia been a customer?

How much did Mia spend last visit?

What is the value of Mia's house?



Data Flow Architecture



Risks Associated with Business Intelligence

- Data from the enterprise applications may not be completely downloaded.
- Errors may be introduced in the downloads, especially when potentially inconsistent data is downloaded from multiple applications and combined in the data warehouse.
- Downloads may not be current.
- Access to the data warehouse may not be secure, with a risk that the data is inappropriately changed.
- Inappropriate changes may be made by individuals with approved access to the data.
- The data may be defined, such as through the use of data universes, incorrectly. Without getting into technical details, data in the warehouses is described in a universe. Programs that analyze the data use these universes to extract the appropriate data, so if the universe is incorrect, the extract and analysis will be wrong.

Risks Associated with Business Intelligence (IT)

- The programs used to generate the report (or information on screen) may not function as intended (just as enterprise application code may not function as intended) due to deficiencies in the development, maintenance, or security of the programs.
- Parameters used to run the analysis may be out of date or otherwise incorrect.

Risks Associated with Business Intelligence (End-User Computing)

- Who owns and operates the data extract? Is it IT (which is more reliable) or the user (generally less reliable)?
- Who owns and is responsible for the data warehouse? Is it IT?
- Who developed and maintains the data universe and the programs used for the analysis? Again, is it IT?
- Are there business process key controls over the integrity of the data used in the analysis? Are they sufficient to identify any error that could lead to a failure of a key hybrid control or result in a material misstatement (such as the posting of an incorrect journal entry for a reserve account)?
- Are there ITGC that can be relied upon to address risks related to data warehouses?