



Lisbon School
of Economics
& Management
Universidade de Lisboa



Carlos J. Costa

BUSINESS INTELLIGENCE



Carlos J. Costa (ISEG)

GD 2021/22 - 1

What Is Business Intelligence?



Business Intelligence



Goal is to deliver accurate real-time information to decision makers



Main analytic functionalities of BI systems

Production reports

Parameterized reports

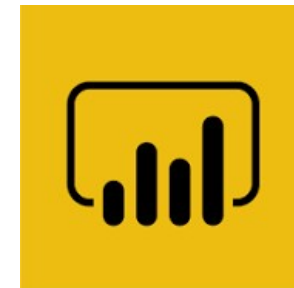
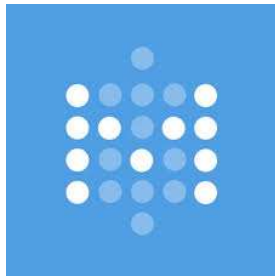
Dashboards/scorecards

Ad hoc query/search/report creation

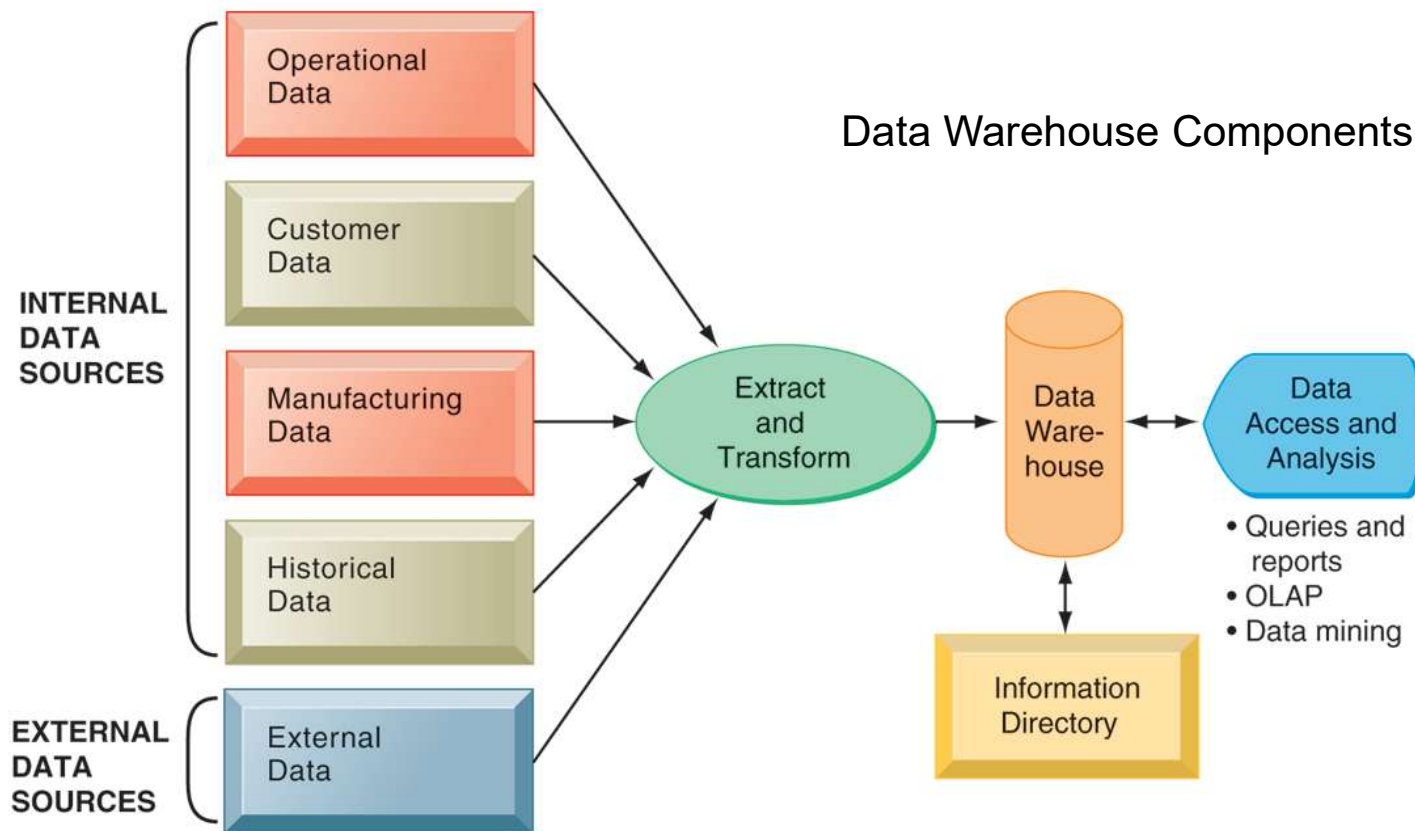
Drill down

Forecasts, scenarios, models

Business intelligence vendors



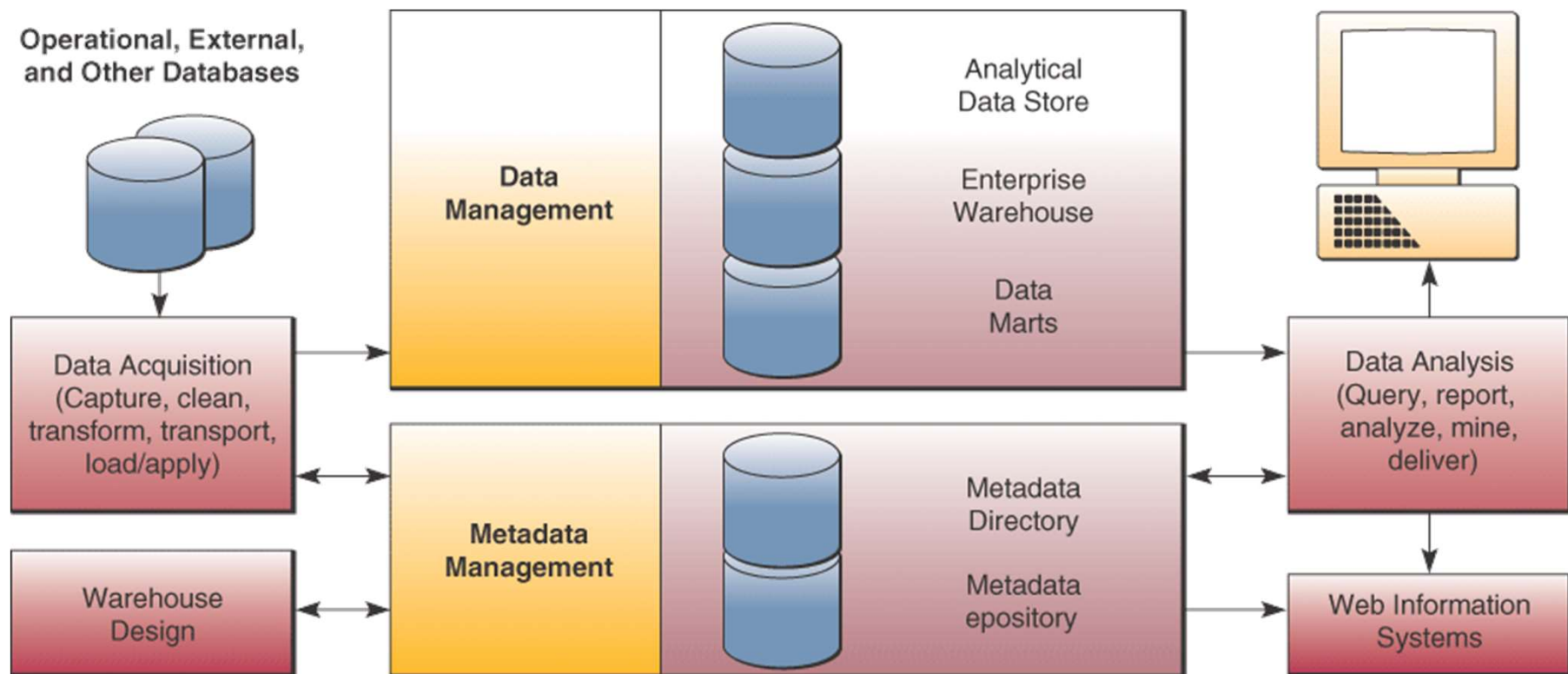
Data Warehouse



Laudon & Laudon (2012)

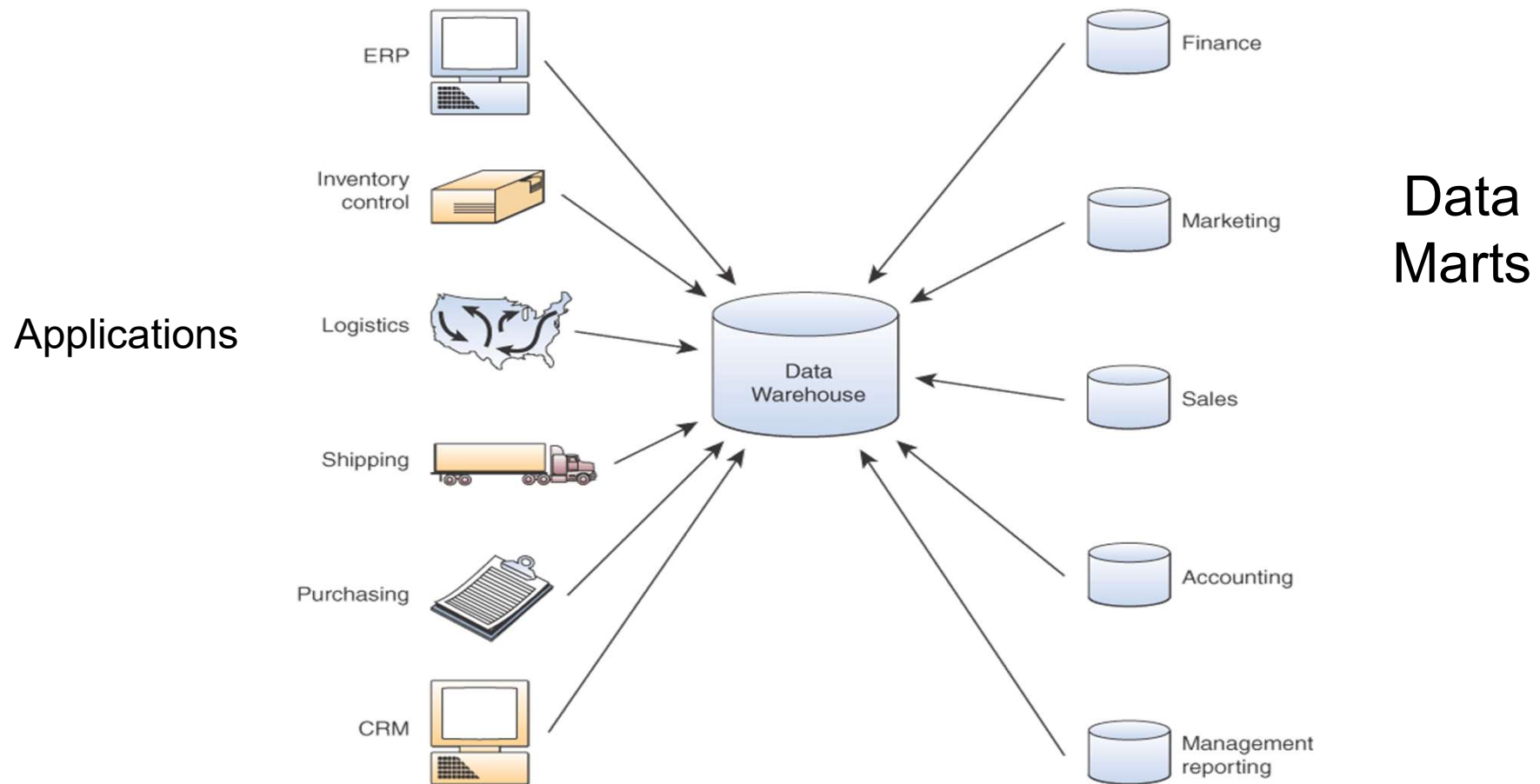
Data Warehouse

Data Warehouse Components



Laudon & Laudon (2012)
Laudon & Laudon (2012)

Data Warehouse



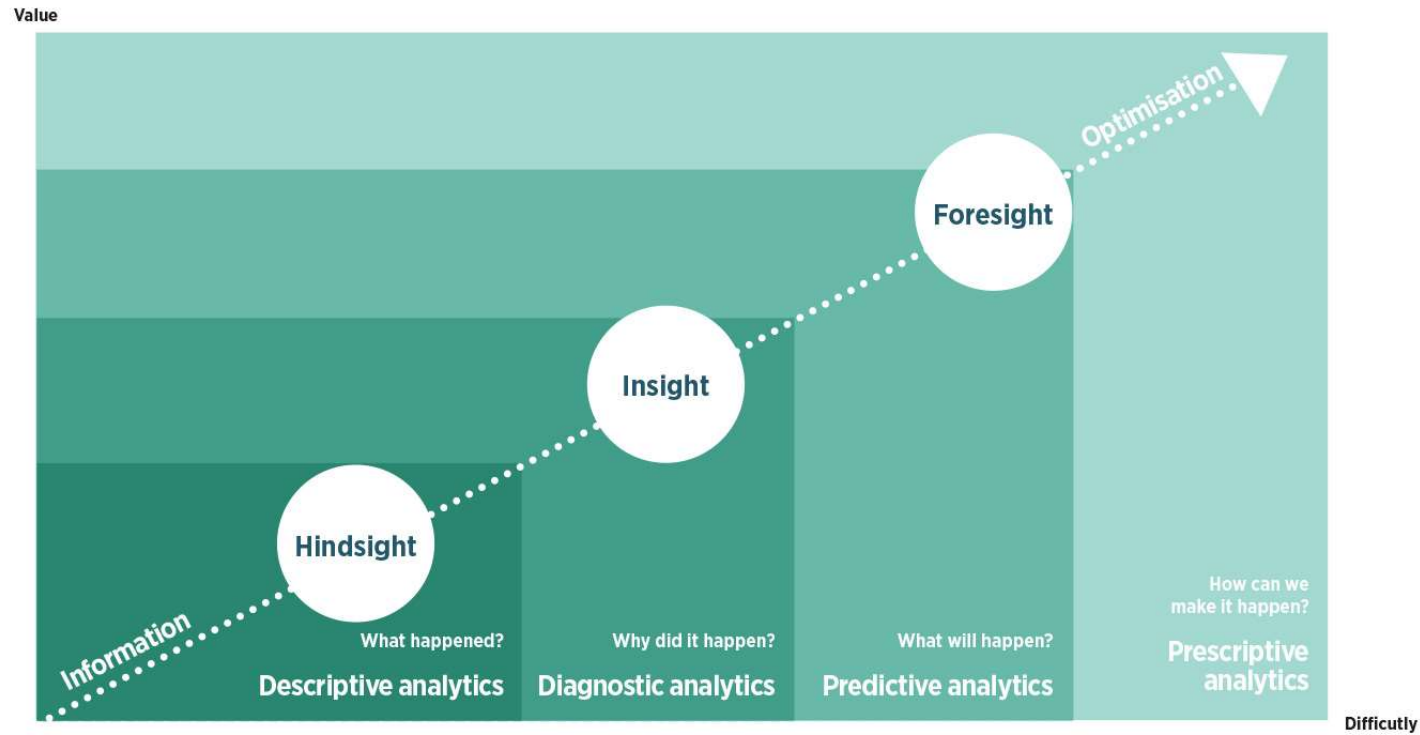
O'Brien & Marakas, 2011

Predefined Production Reports

BUSINESS FUNCTIONAL AREA	PRODUCTION REPORTS
Sales	Forecast sales; sales team performance; cross-selling; sales cycle times
Service/call center	Customer satisfaction; service cost; resolution rates; churn rates
Marketing	Campaign effectiveness; loyalty and attrition; market basket analysis
Procurement and support	Direct and indirect spending; off-contract purchases; supplier performance
Supply chain	Backlog; fulfillment status; order cycle time; bill of materials analysis
Financials	General ledger; accounts receivable and payable; cash flow; profitability
Human resources	Employee productivity; compensation; workforce demographics; retention

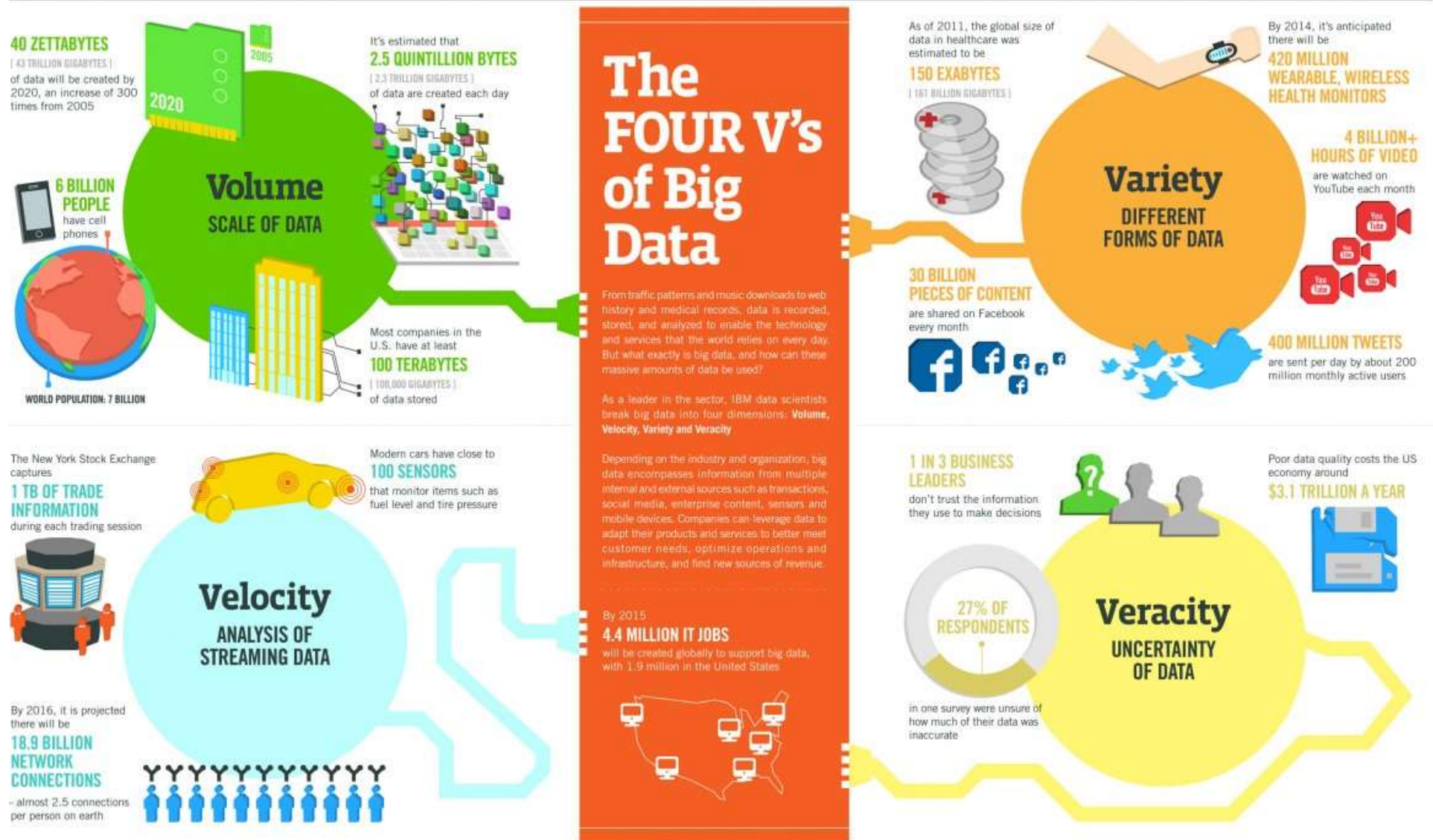
Predictive Analytics

MEASURING THE DIFFICULTY AND VALUE OF ANALYTICS



Source: Gartner

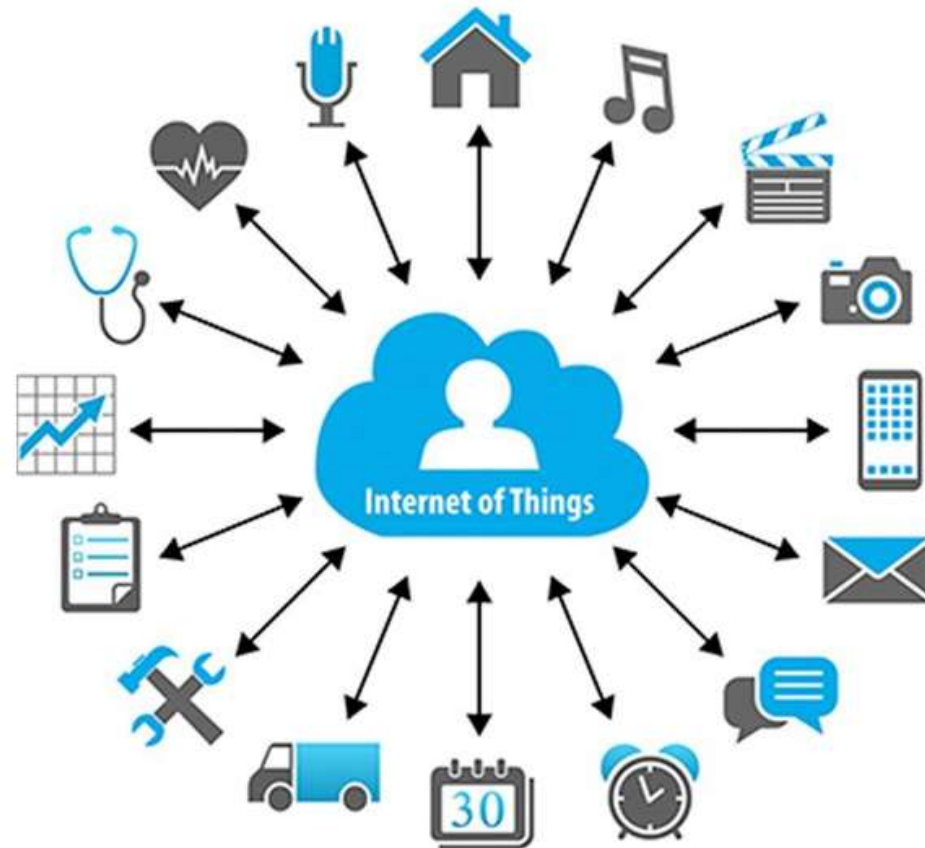
Big Data Analysis



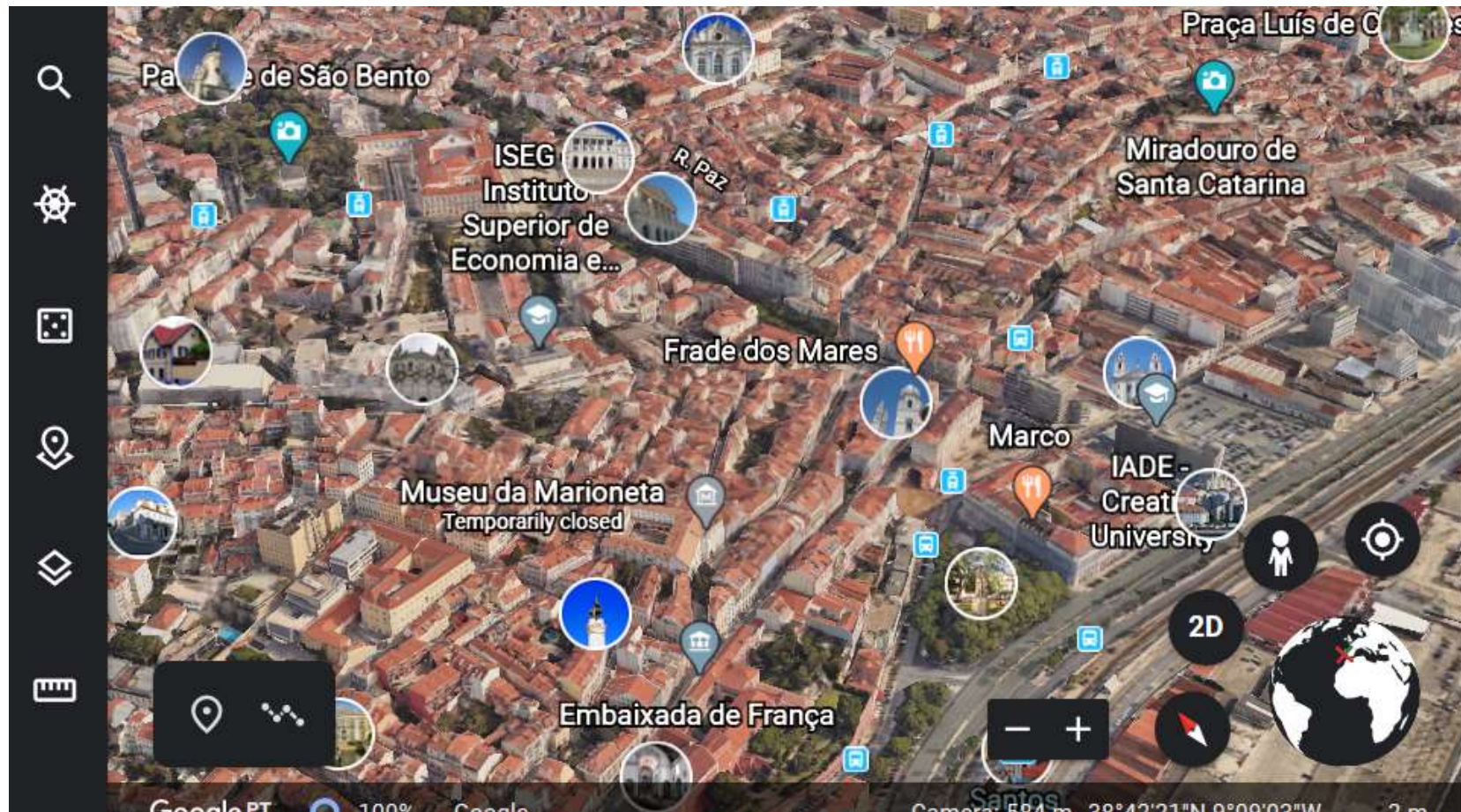
Sources: McKinsey Global Institute, Twitter, Cisco, Gartner, EMC, SAS, IBM, MEPTec, GAS

IBM

Internet of Things (IoT)



Location Analytics and Geographic Information Systems



BI Users

Power Users: Producers (20% of employees)

IT developers

Super users

Business analysts

Analytical modelers

Capabilities

Production Reports

Parameterized Reports

Dashboards/Scorecards

Ad hoc queries; Drill down
Search/OLAP

Forecasts; What if
Analysis; statistical models

Casual Users: Consumers (80% of employees)

Customers/Suppliers
Operational employees

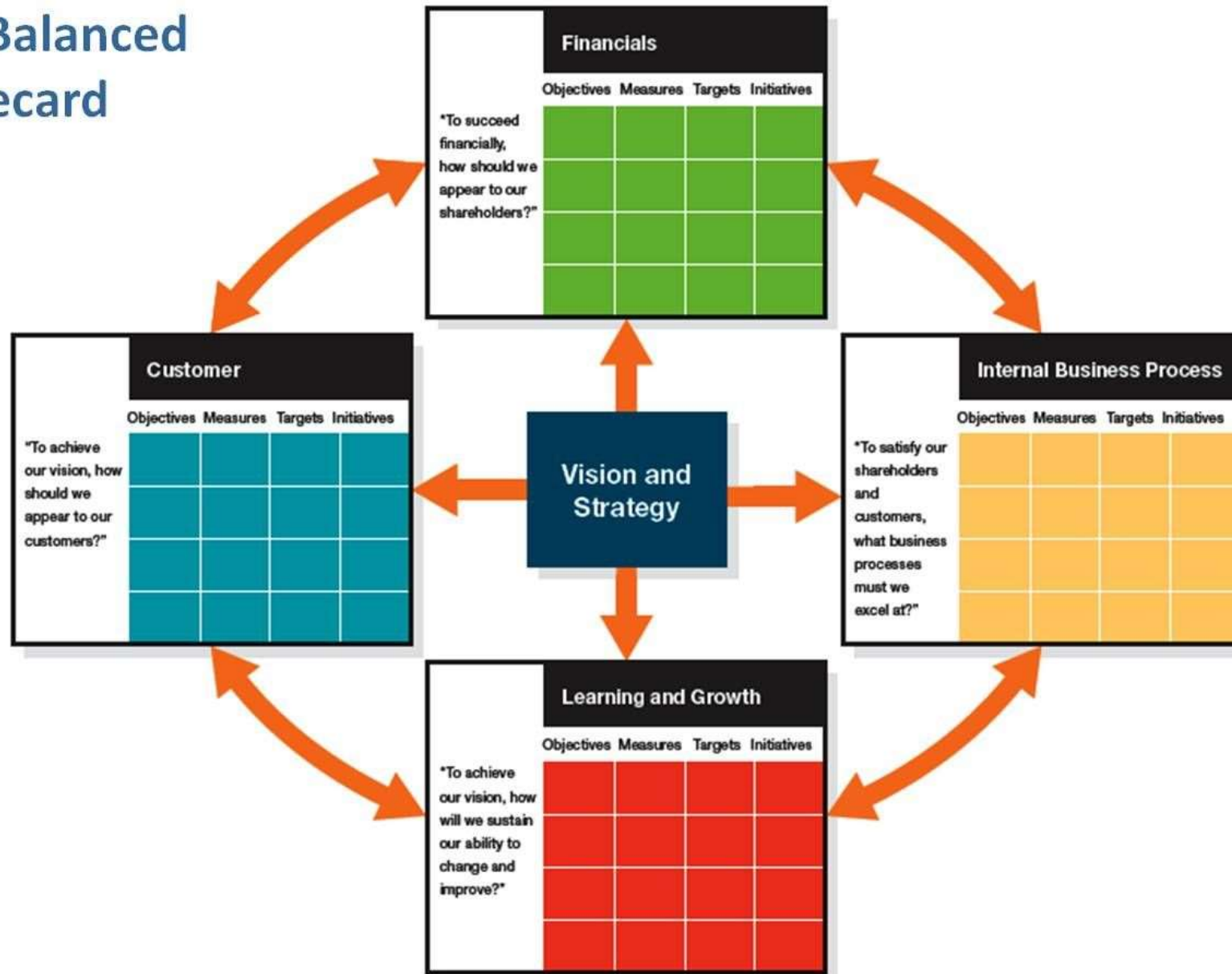
Senior managers

Managers/Staff

Business analysts

Laudon & Laudon (2012)

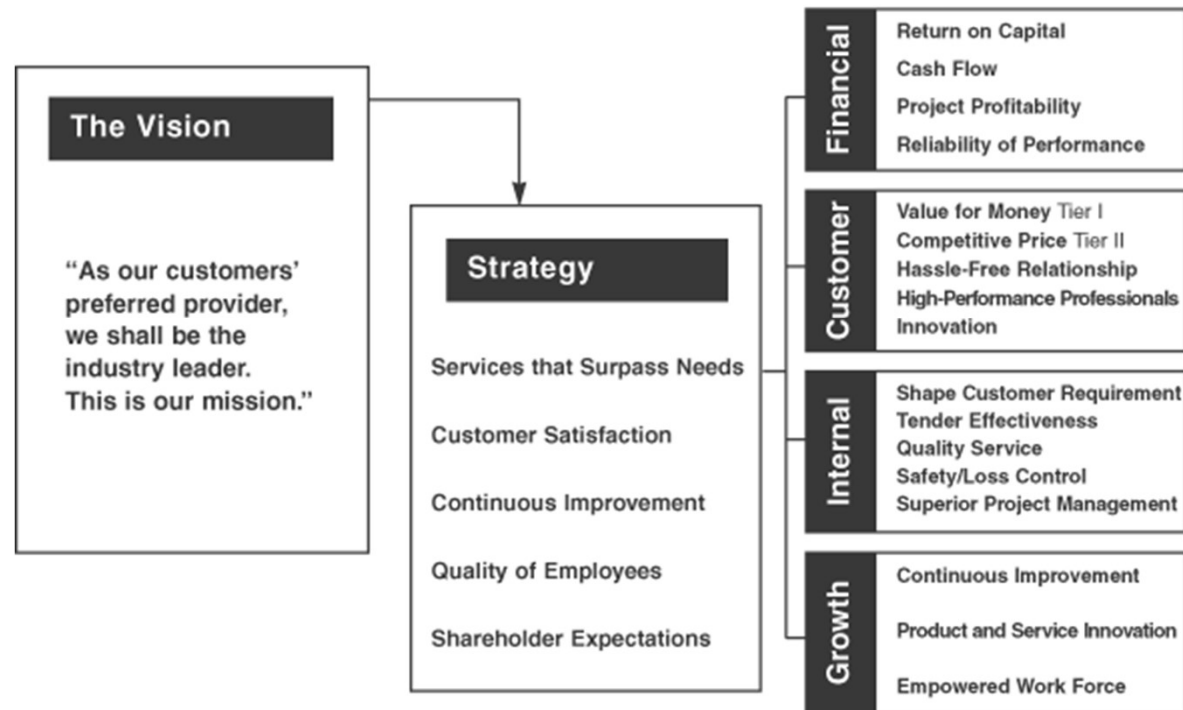
The Balanced Scorecard



Decision Support for Senior Management

The Balanced Scorecard Framework

Rockwater's Strategic Objectives



Kaplan & Norton (1993)

Decision Support for Senior Management



Decision Support for Senior Management

Business performance management (BPM)

- Translates firm's strategies (e.g., differentiation, low-cost producer, scope of operation) into operational targets
- KPIs developed to measure progress toward targets

Data for ESS

- Internal data from enterprise applications
- External data such as financial market databases
- Drill-down capabilities

Decision Support Systems



Allows support for semi structured decisions



Use mathematical or analytical models



Allow a variety of analysis:

- “What-if” analysis
- Sensitivity analysis
- Backward sensitivity analysis
- Multidimensional analysis / OLAP (ex: pivot tables)

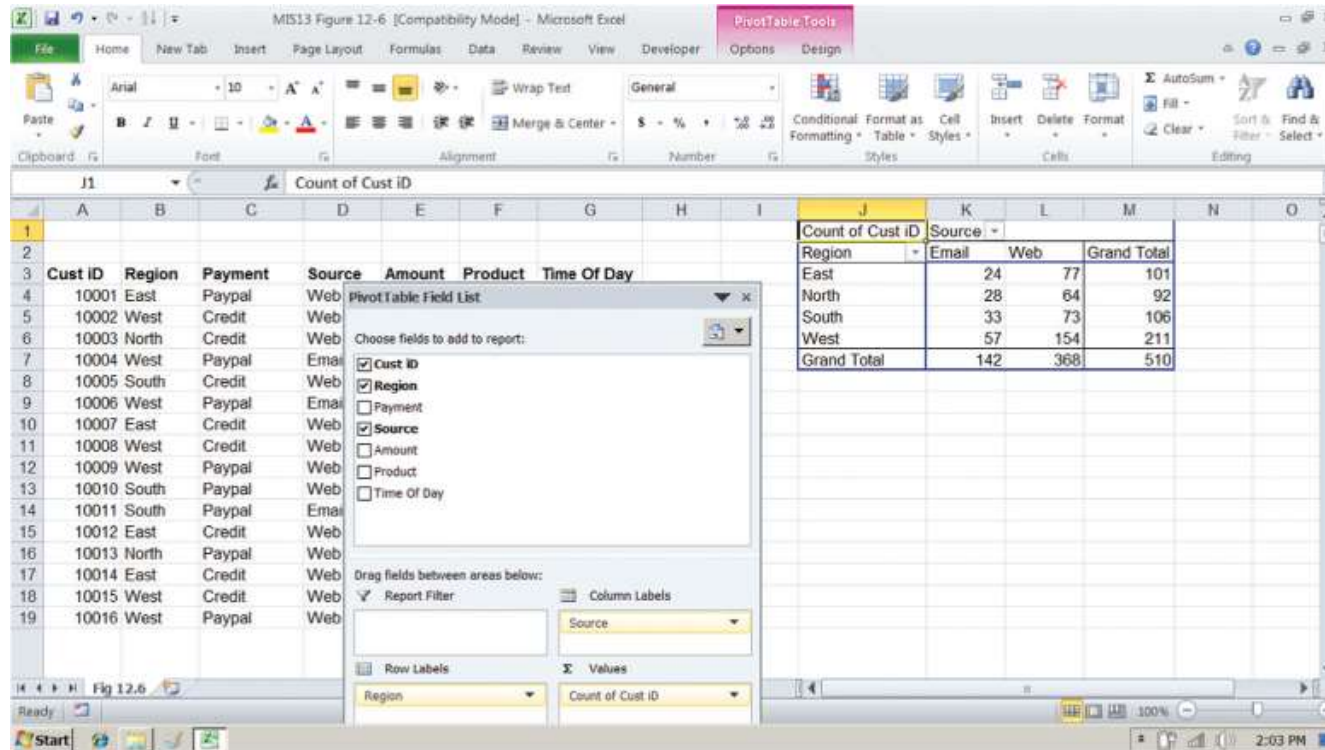
Sensitivity Analysis

Total fixed costs	19000					
Variable cost per unit	3					
Average sales price	17					
Contribution margin	14					
Break-even point	1357					
		Variable Cost per Unit				
Sales	1357	2	3	4	5	6
Price	14	1583	1727	1900	2111	2375
	15	1462	1583	1727	1900	2111
	16	1357	1462	1583	1727	1900
	17	1267	1357	1462	1583	1727
	18	1188	1267	1357	1462	1583

Laudon & Laudon (2012)

A Pivot Table

Examining Customer Regional Distribution and Advertising



Laudon & Laudon (2012)

Group Decision-Support Systems (GDSS)

- Voting
- Brainstorming
- Other techniques





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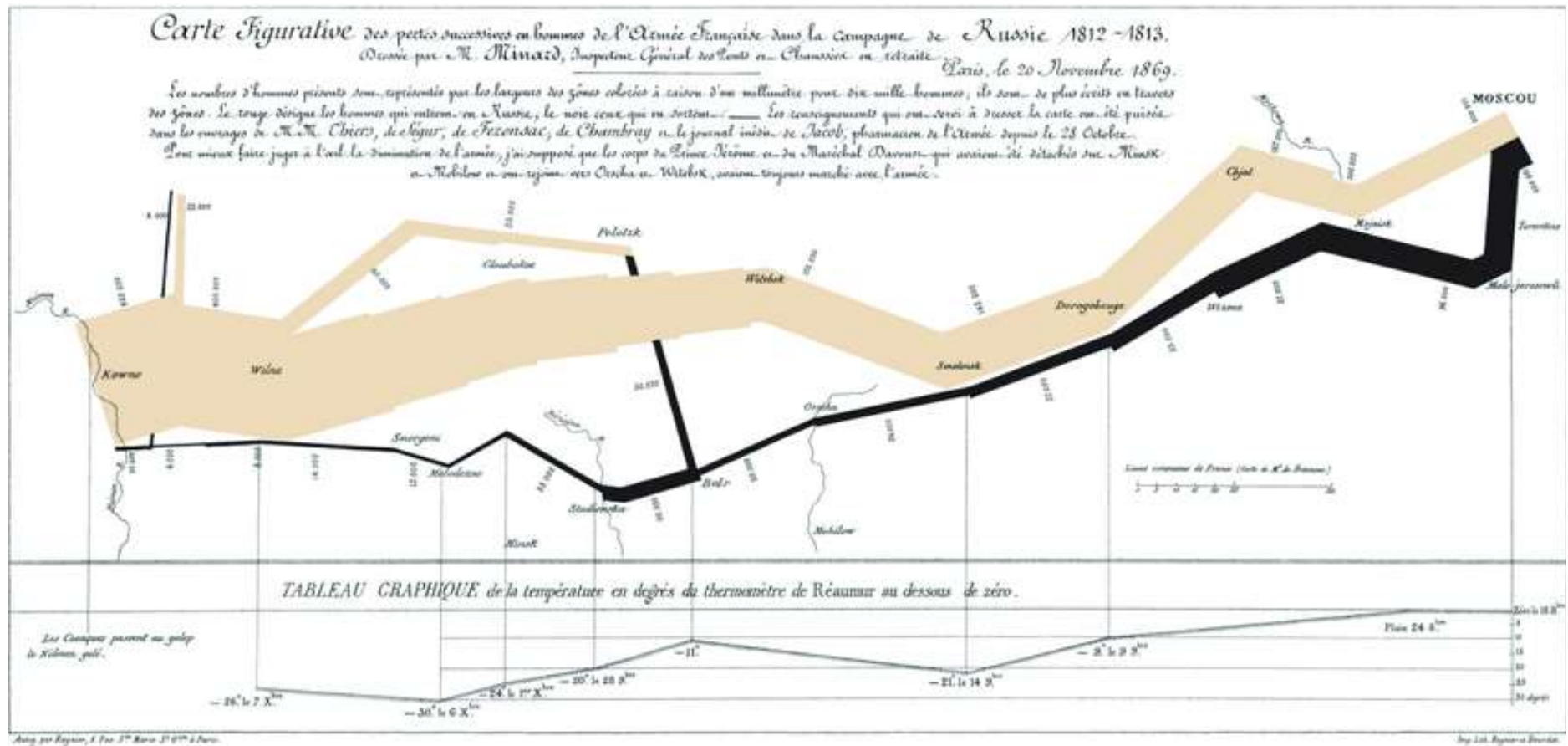


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DATA VISUALIZATION



Data visualization



Problems with data visualization

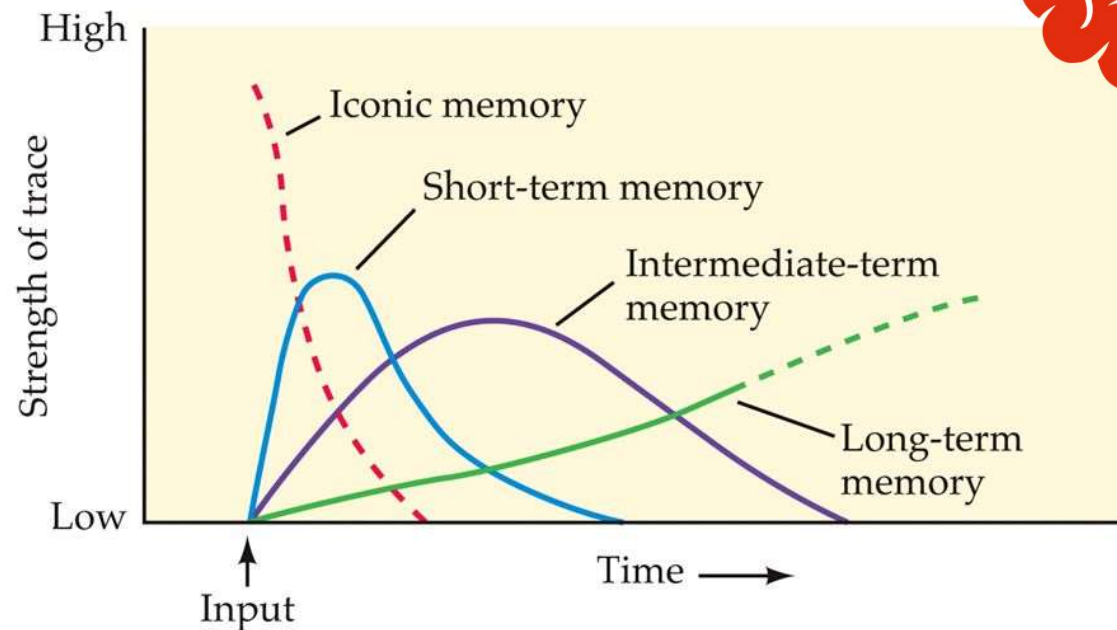
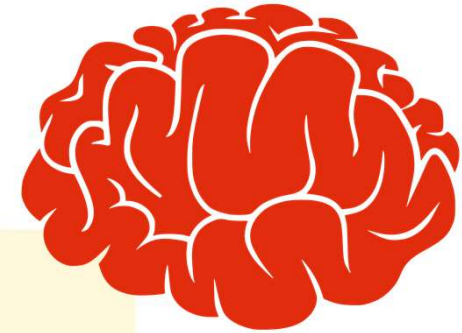


Problems with data visualization



Memory

Stages of Memory Formation



BIOLOGICAL PSYCHOLOGY 7e, Figure 17.6
© 2013 Sinauer Associates, Inc.

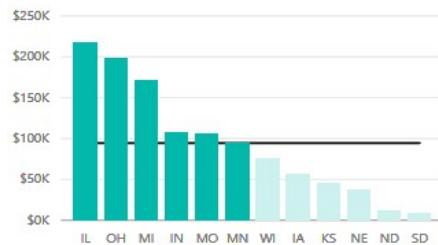
Iconic memory

Short Term
memory

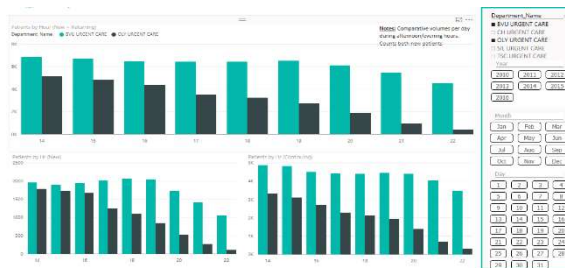
Long Term
memory

Gestalt's principles

Proximity and Similarity



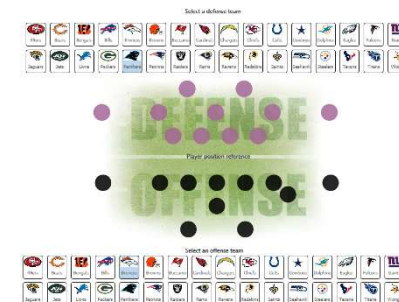
Closure and Simmetry



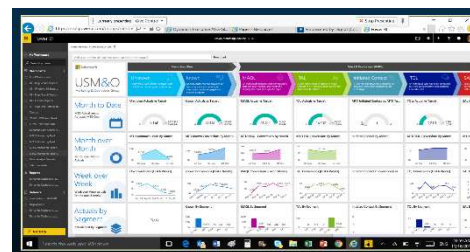
Continuity



Figure-Ground



Simetry and continuity

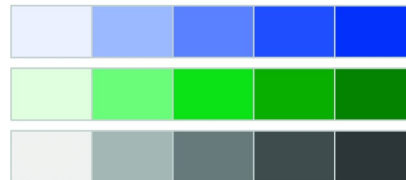


Colour

(A) Qualitative (isoluminant)



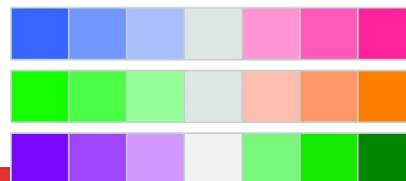
(B) Sequential (single hue)



(C) Sequential (multi hue)



(D) Diverging



Character Fonts

Font Family

serif Sans serif

Display *Handwriting*

Monospace

Text Indent

Line height

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Morbi id magna a lorem sollicitudin fermentum. Pellentesque suscipit ante lorem, bibendum luctus enim imperdiet id. Phasellus finibus nisi lectus, at pharetra libero cursus a. Nulla fringilla elit eu lacus molestie volutpat.

Font Size
18px

T

Letter spacing Word Spacing

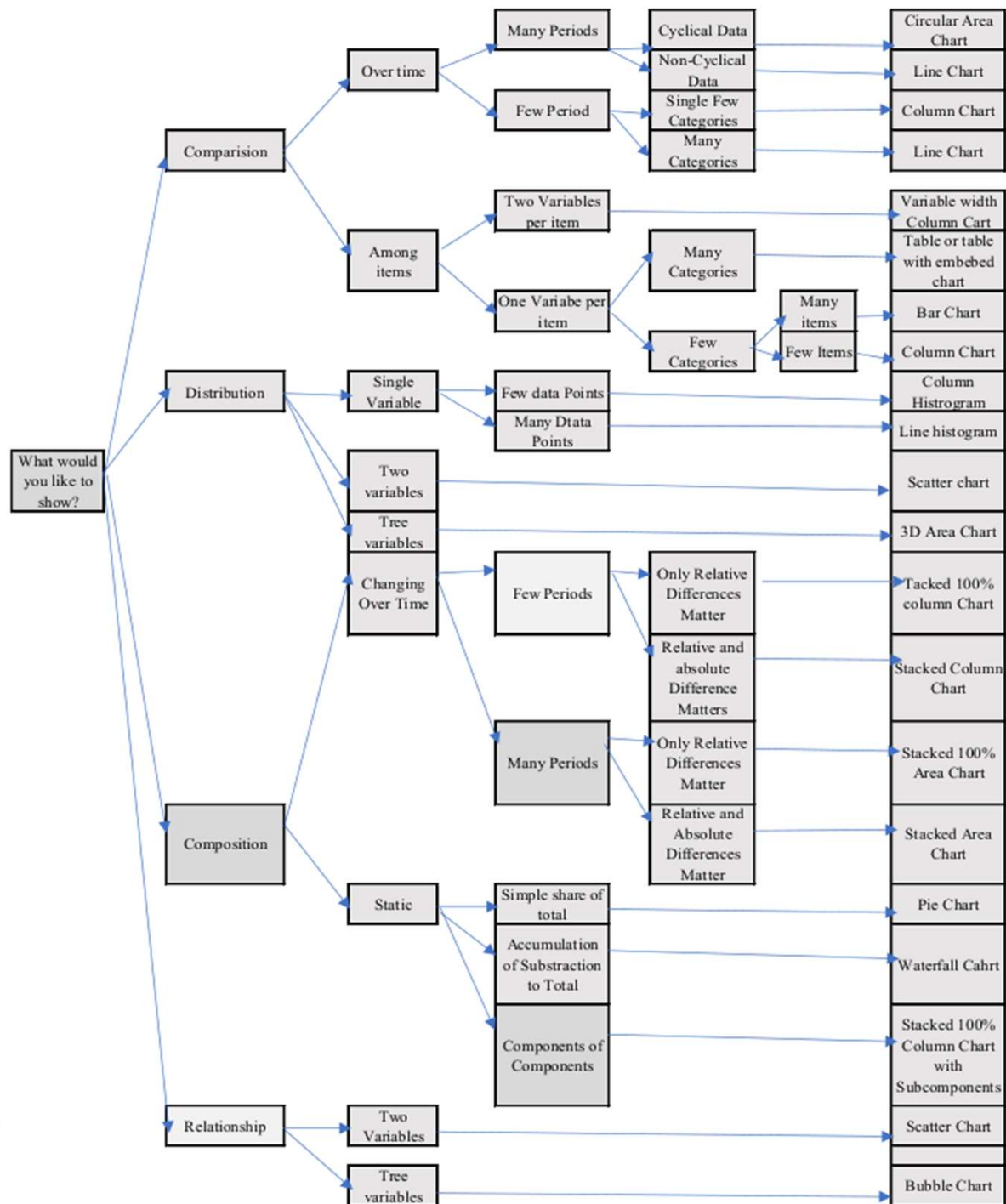
Typography is good for design

Normal *Italic* *Oblique*

Black Bold Regular Light Thin

Good Dashboard

sqlbi. The 15 Rules to Design a Perfect Dashboard http://sqlbi.com/dashboard				
1  Design for a target	2  Keep everything at a glance	3  Keep it simple	4  Align elements	5  Be consistent
6  Highlight the most relevant information	7  Be clear	8  Start from zero	9  Shorten the numbers	10  Show the context
11  Choose the right colors	12  Design dashboards, not reports	13  Show variations	14  Leave the noise off	15  Pick the right charts





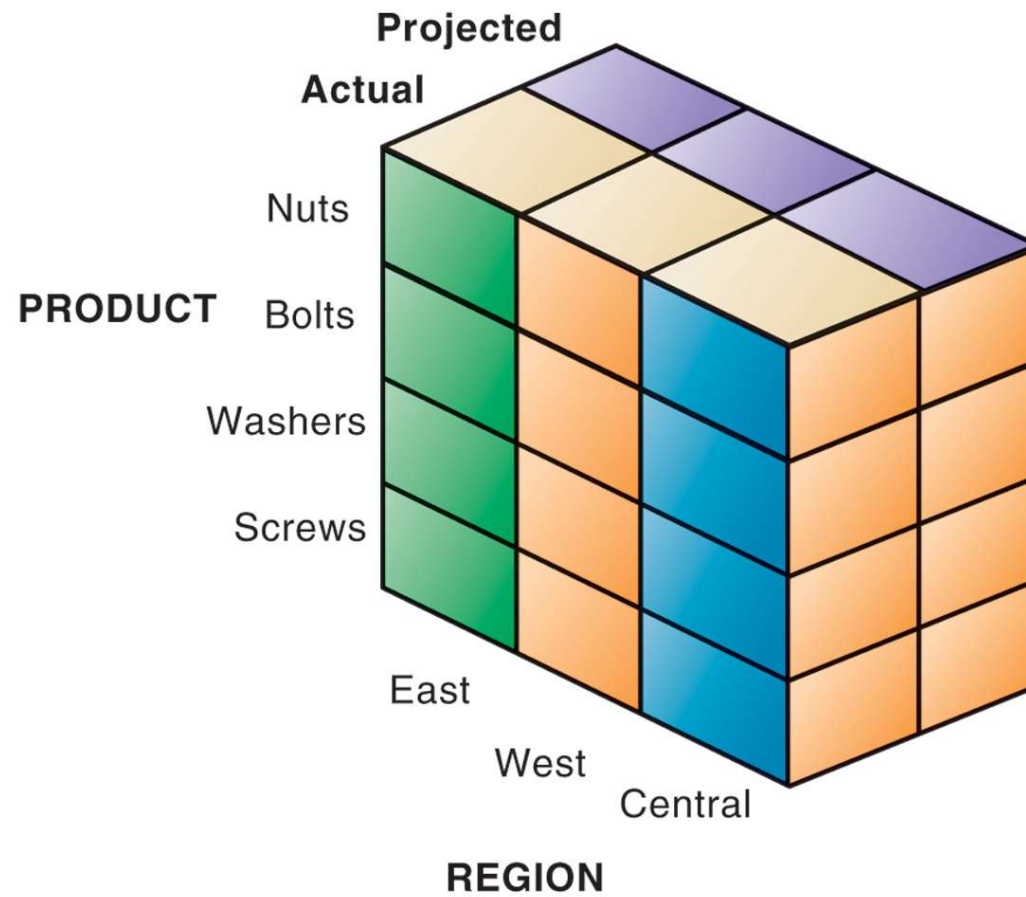
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MULTIDIMENSIONAL STRUCTURE



OLAP



Multidimensional Data Model

- a variation of the relational model that uses multidimensional structures to organize data and express the relationships between data

O'Brien & Marakas (2009).

Dimensional Schema



Primary keys



Foreign keys



Fact tables



Dimension Tables



Star schemas

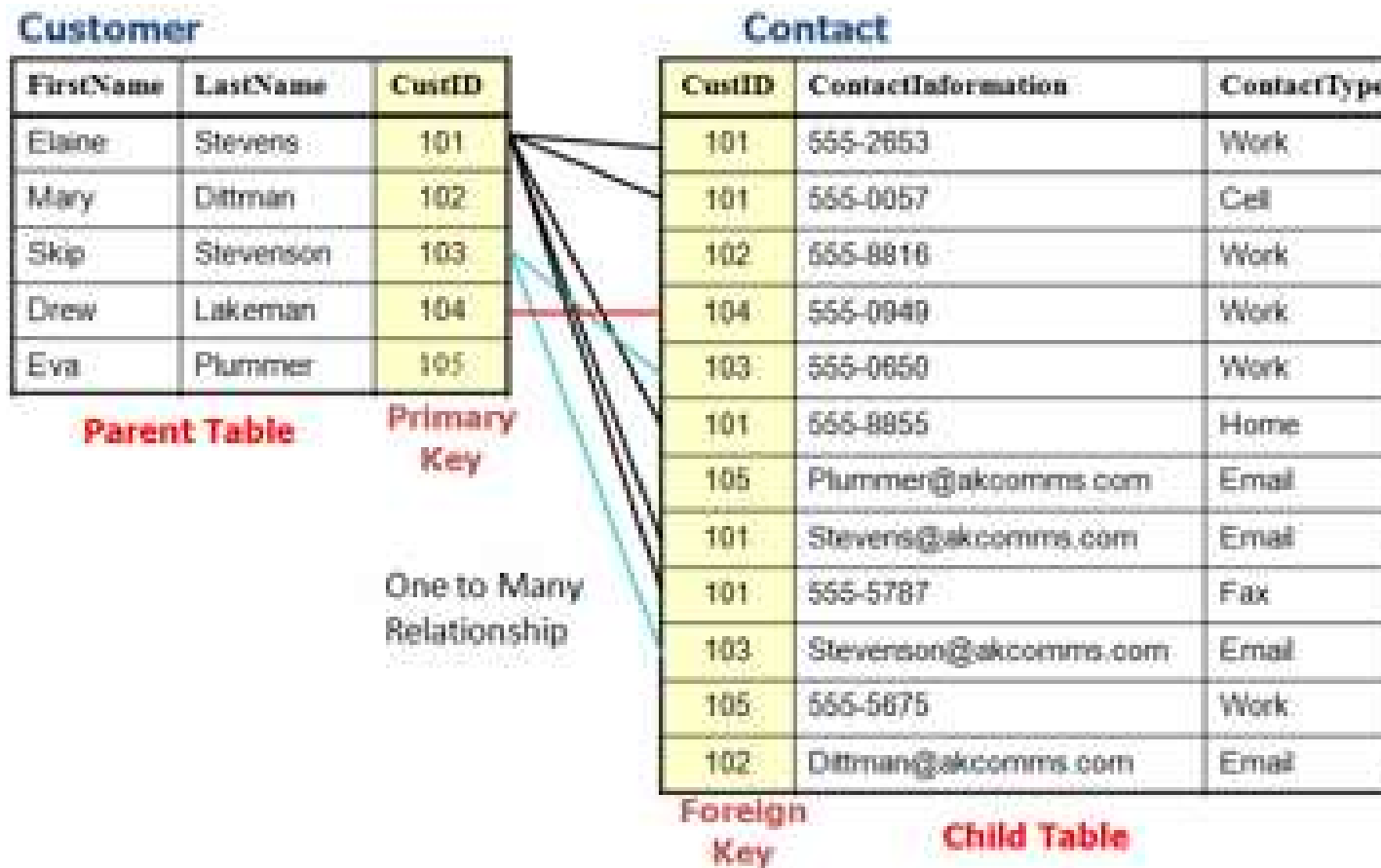


Snowflake schemas

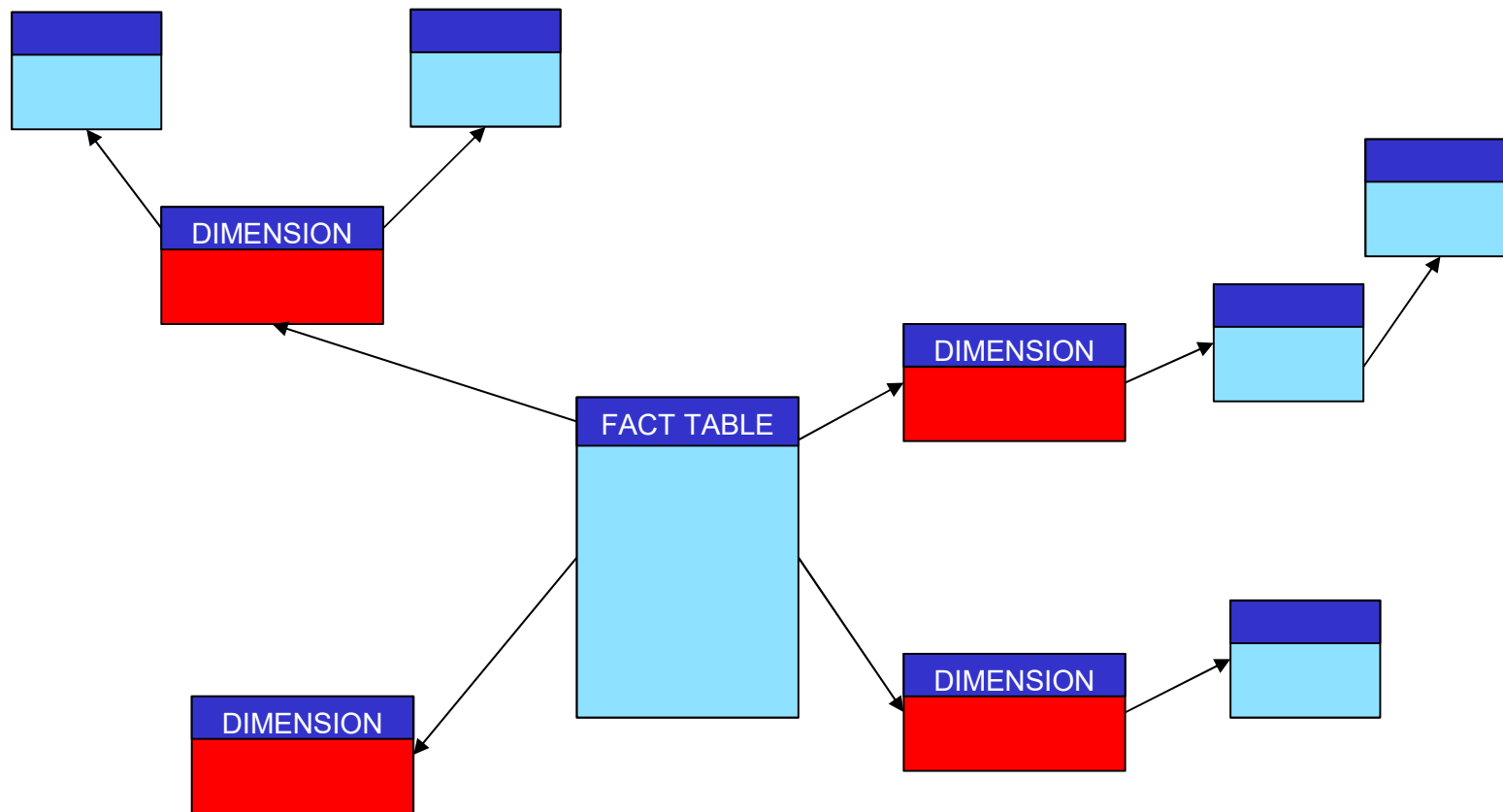
What is a Primary



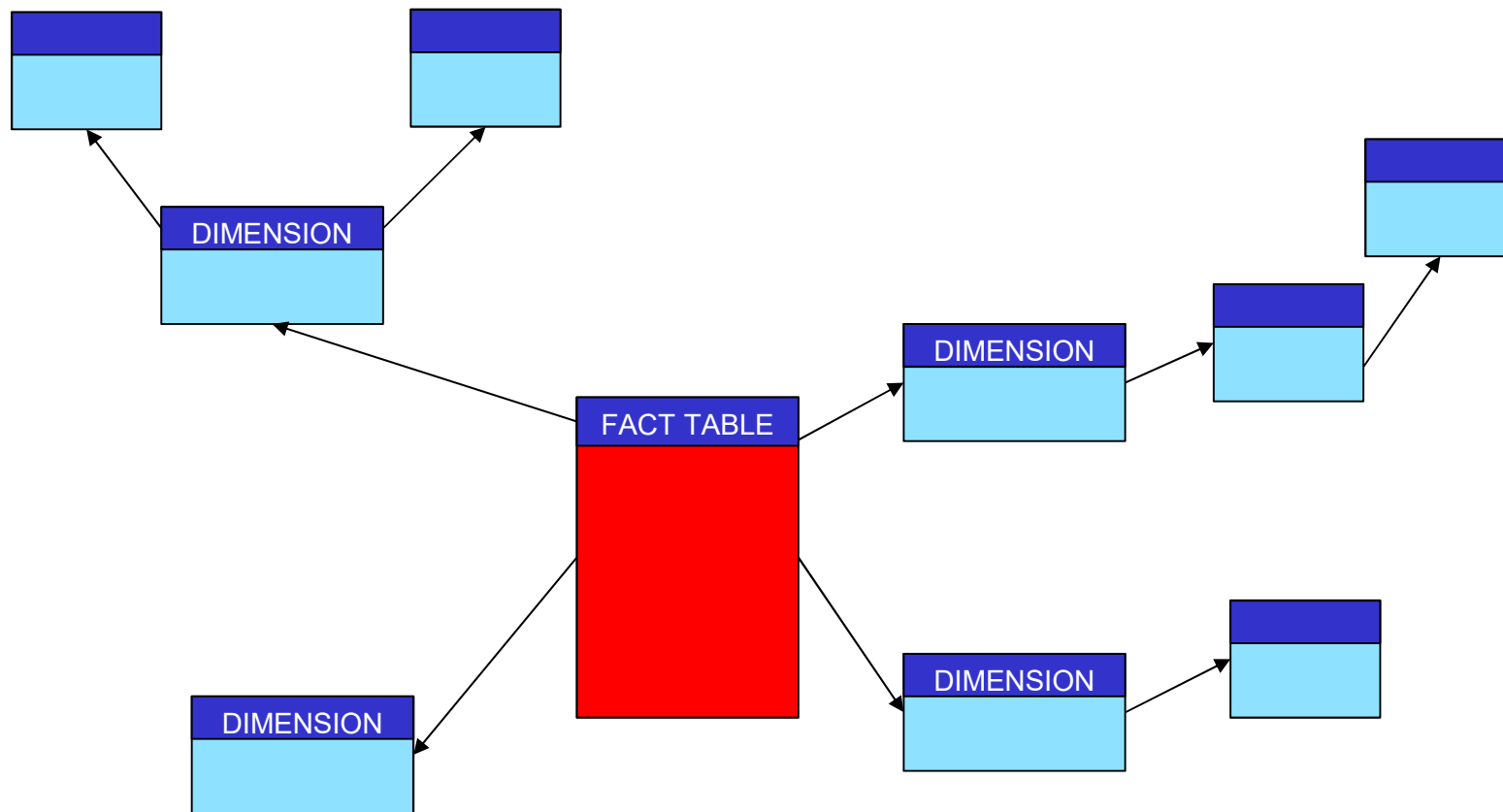
Foreign Key



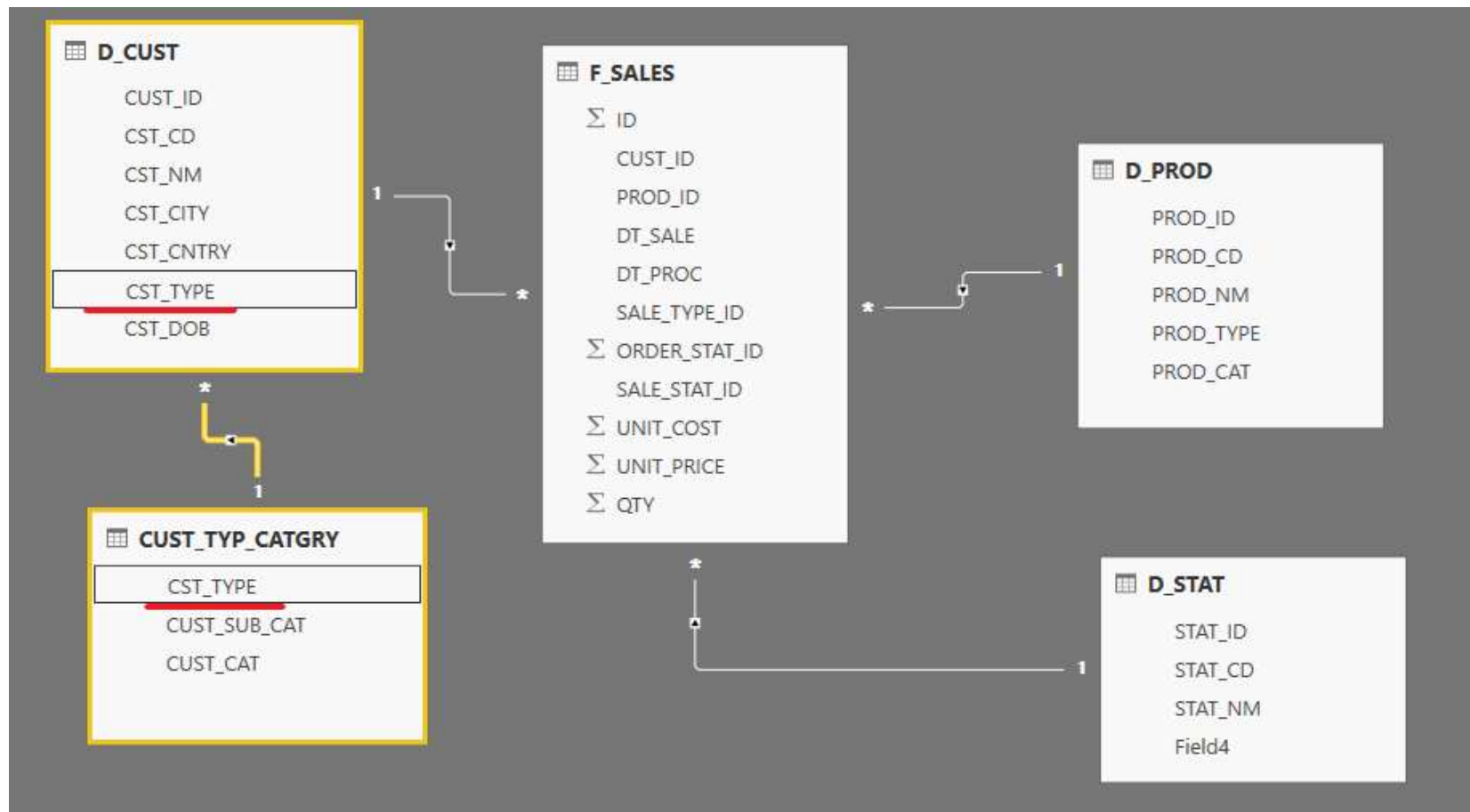
Dimension tables



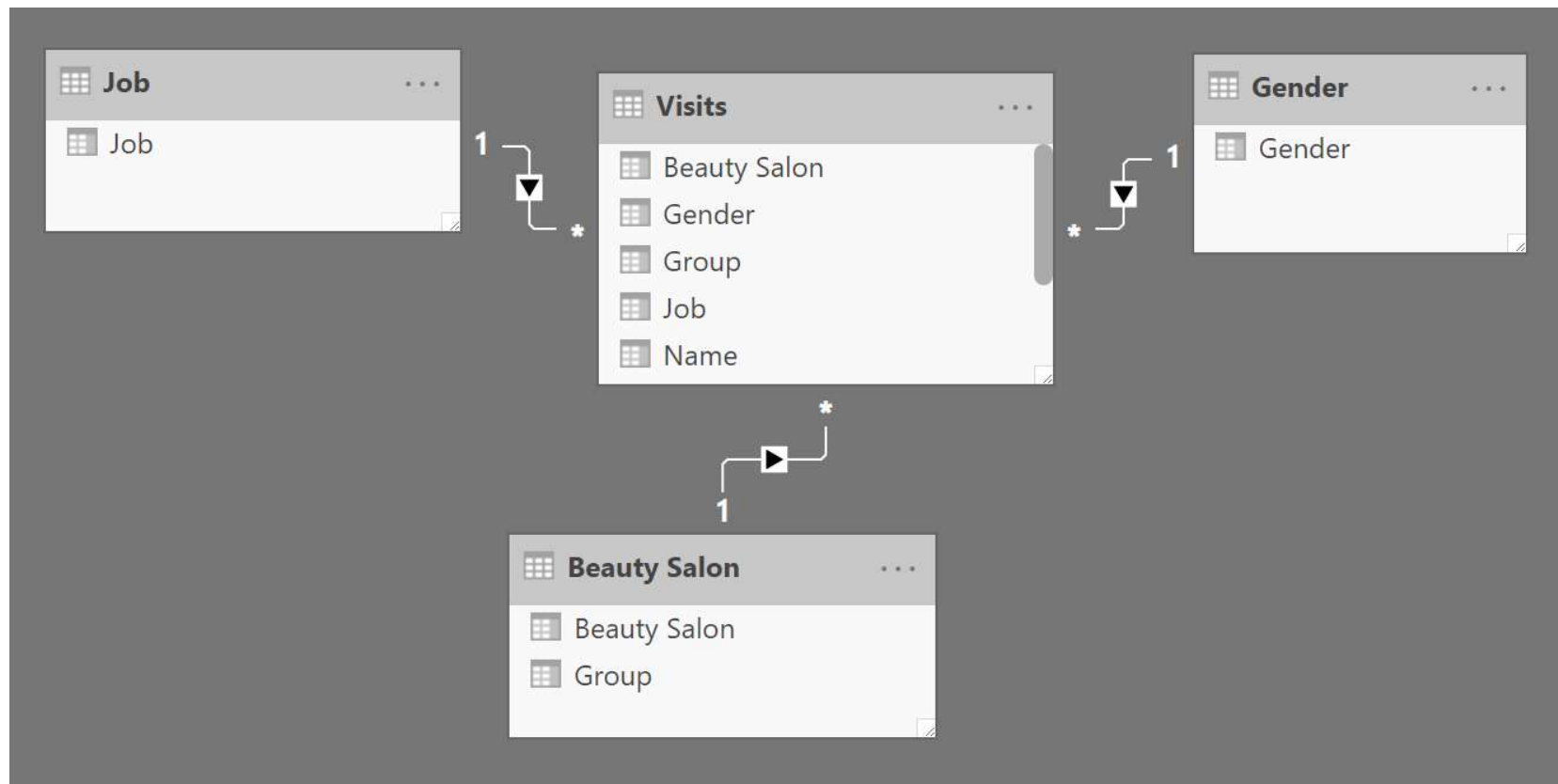
Fact Table

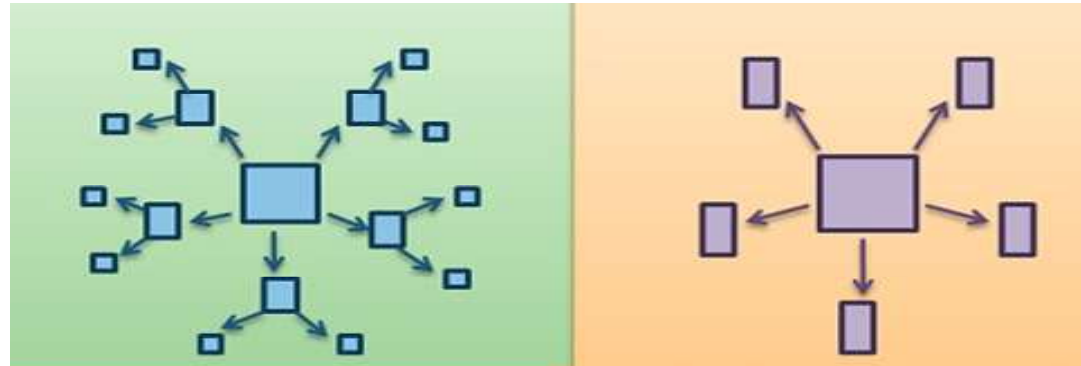


Snowflake schemas



Star schemas





Snowflake Schema

Star Schema

Ease of maintenance / change	No redundancy and hence more easy to maintain and change	Has redundant data and hence less easy to maintain/change
Ease of Use	More complex queries and hence less easy to understand	Less complex queries and easy to understand
Query Performance	More foreign keys-and hence more query execution time	Less no. of foreign keys and hence lesser query execution time
Type of Datawarehouse	Good to use for datawarehouse core to simplify complex relationships (many:many)	Good for datamarts with simple relationships (1:1 or 1:many)
Joins	Higher number of Joins	Fewer Joins
Dimension table	It may have more than one dimension table for each dimension	Contains only single dimension table for each dimension
When to use	When dimension table is relatively big in size, snowflaking is better as it reduces space.	When dimension table contains less number of rows, we can go for Star schema.
Normalization/ De-Normalization	Dimension Tables are in Normalized form but Fact Table is still in De-Normalized form	Both Dimension and Fact Tables are in De-Normalized form
Data model	Bottom up approach	Top down approach