



LISBON
**SCHOOL OF
ECONOMICS &
MANAGEMENT**
UNIVERSIDADE DE LISBOA

Carlos J. Costa

BUSINESS INTELLIGENCE



What Is Business Intelligence?

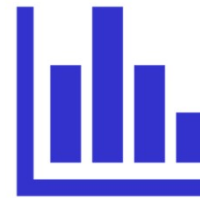




Business Intelligence



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



Main analytic functionalities of BI systems

Production reports

Parameterized reports

Dashboards/scorecards

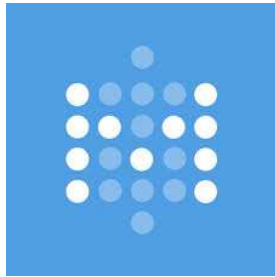
Ad hoc query/search/report creation

Drill down

Forecasts, scenarios, models

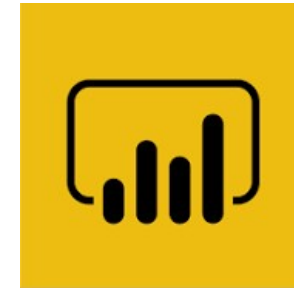


Business intelligence vendors



Qlik 

 + a b l e a u

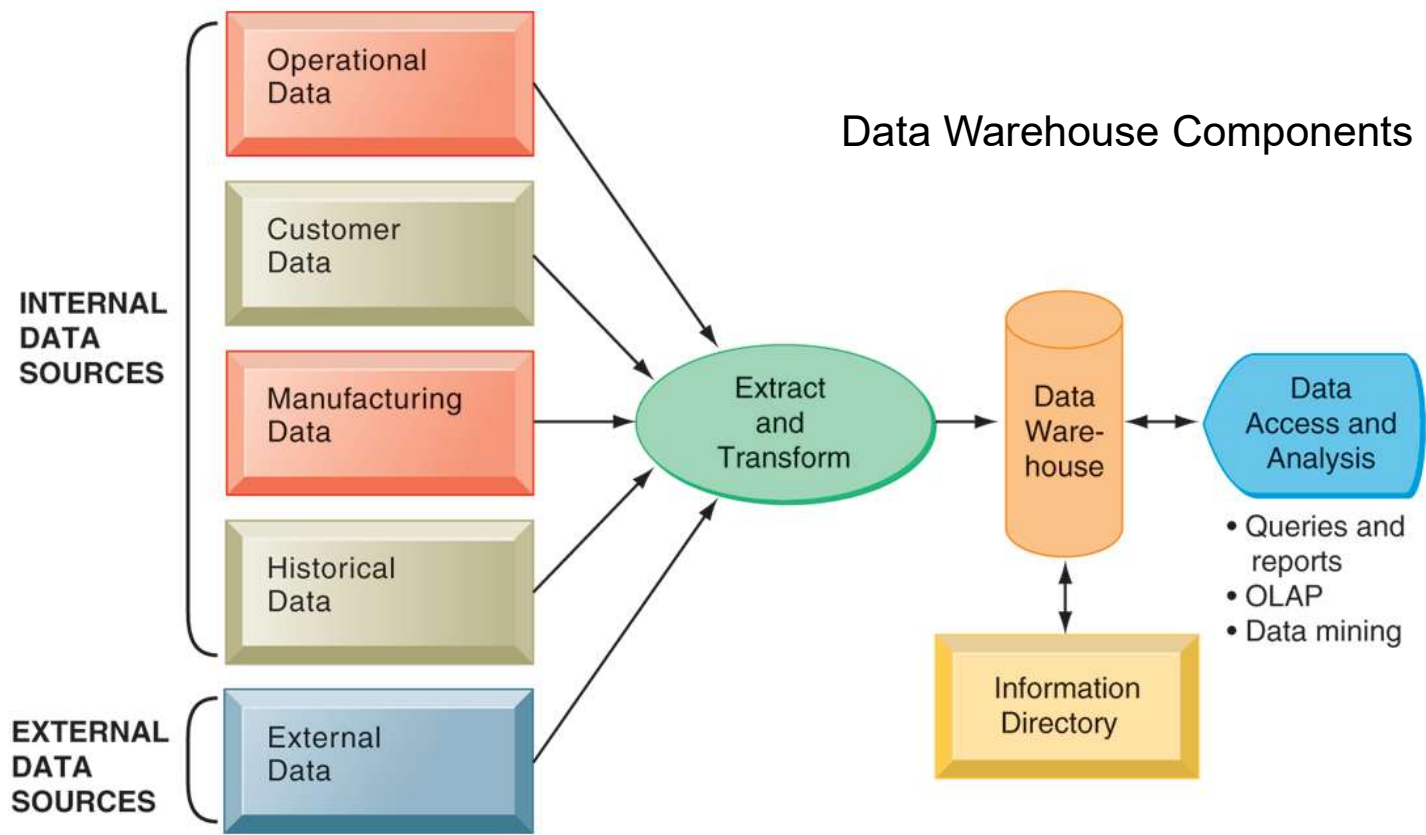


 pentaho 

 spagobi



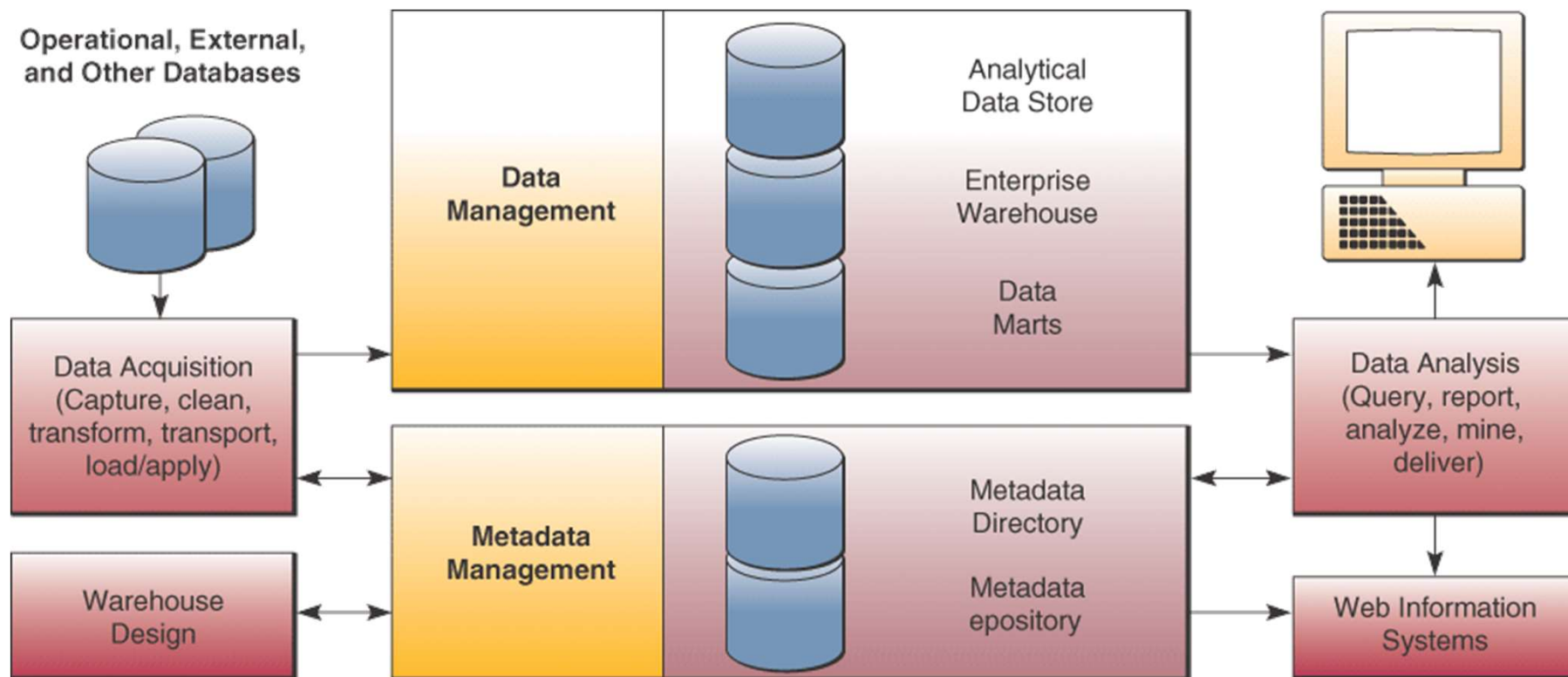
Data Warehouse



Laudon & Laudon (2012)

Data Warehouse

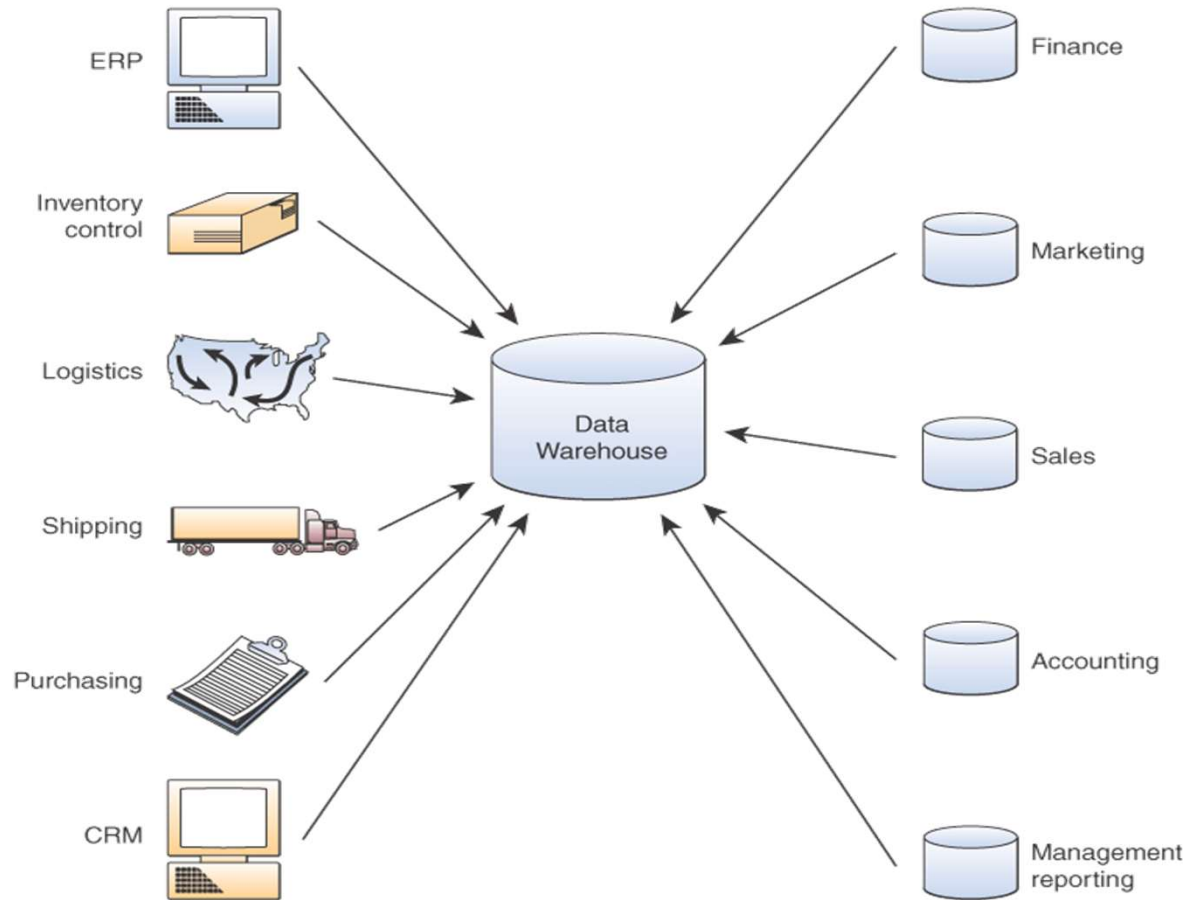
Data Warehouse Components





Data Warehouse

Applications



Data
Marts

O'Brien & Marakas, 2011

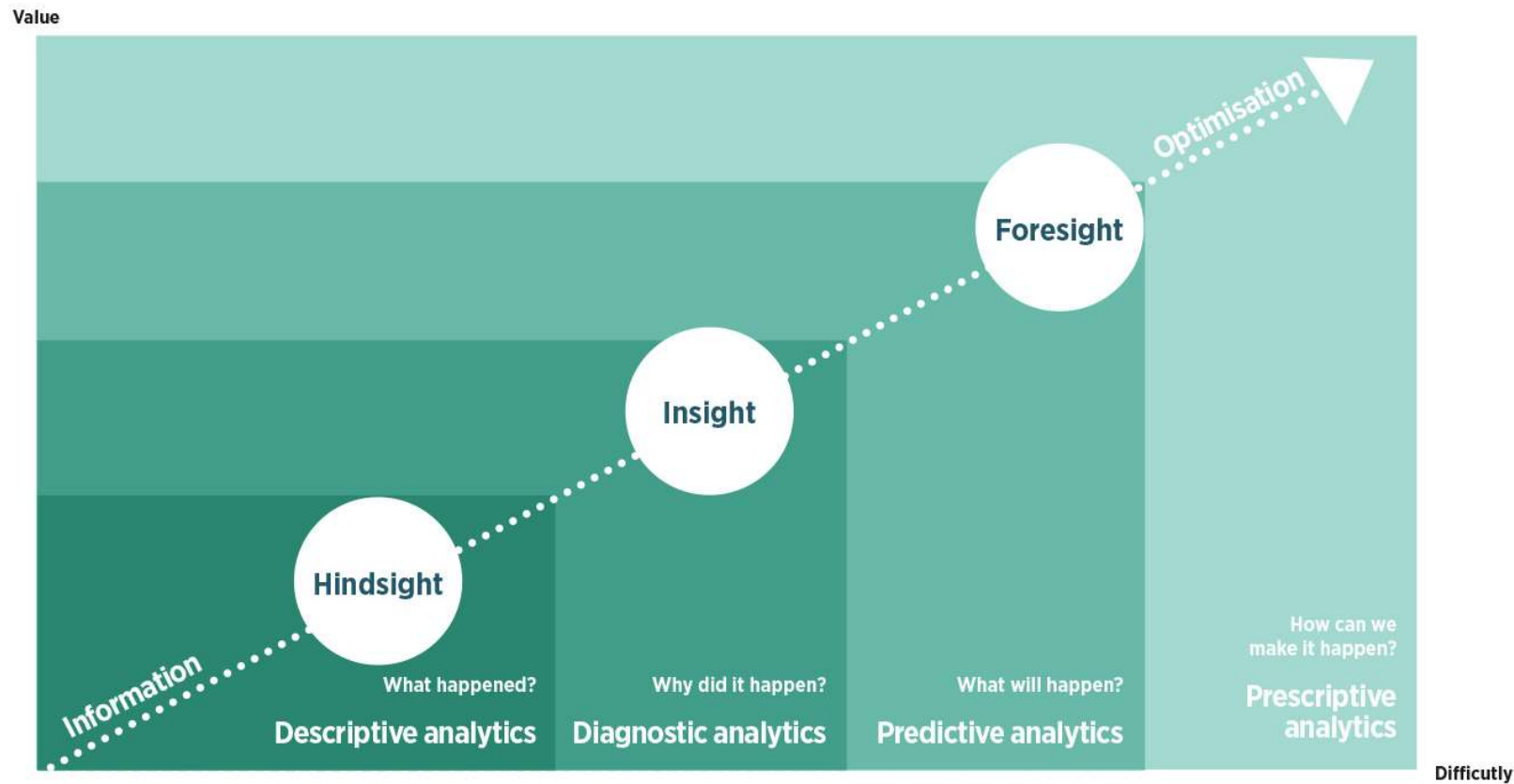


Predefined Production Reports

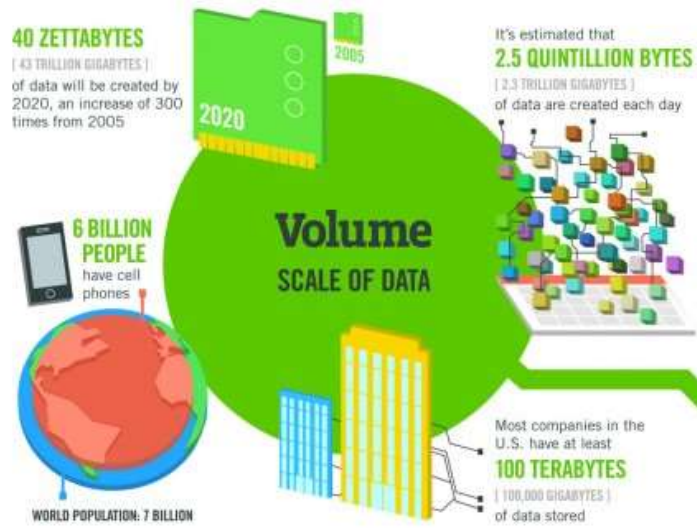
BUSINESS FUNCTIONAL AREA	PRODUCTION REPORTS
Sales	Forecast sales; sales team performance; cross-selling; sales cycle times
Service/call center	Customer satisfaction; service cost; resolution rates; churn rates
Marketing	Campaign effectiveness; loyalty and attrition; market basket analysis
Procurement 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



Source: Gartner



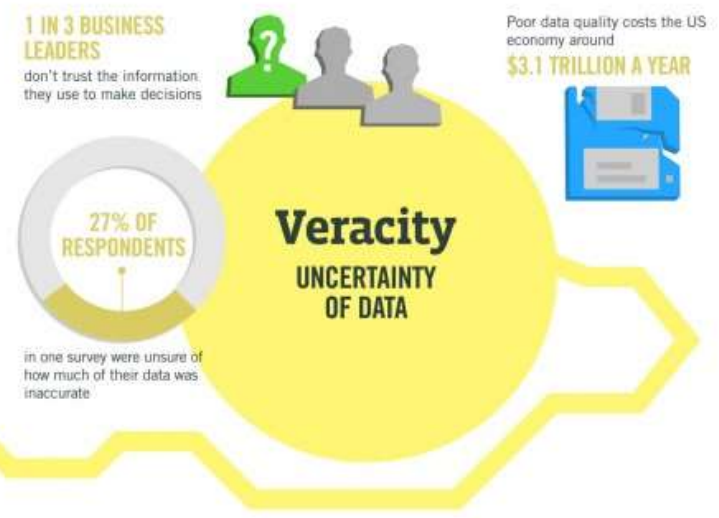
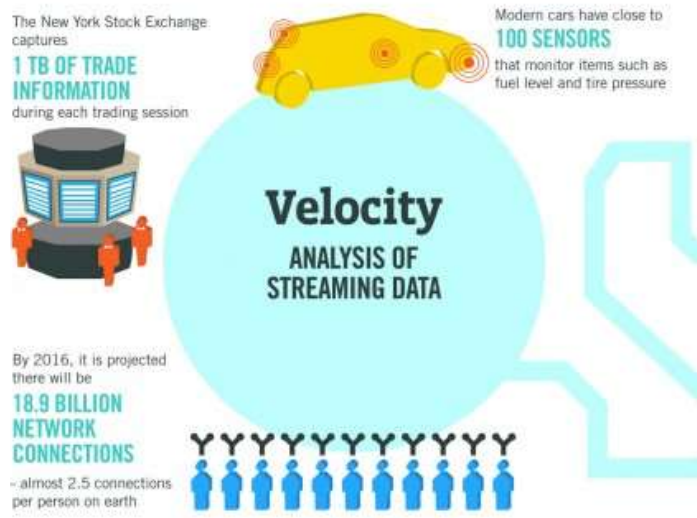
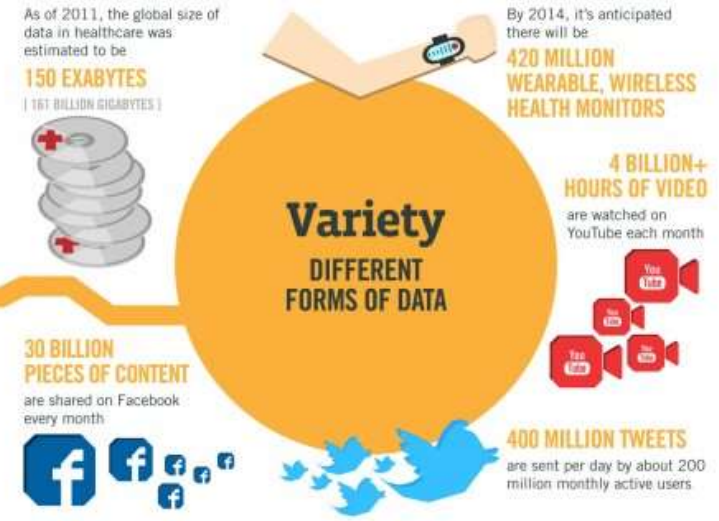
The FOUR V's of Big Data

From traffic patterns and music downloads to web history and medical records, data is recorded, stored, and analyzed to enable the technology and services that the world relies on every day. But what exactly is big data, and how can these massive amounts of data be used?

As a leader in the sector, IBM data scientists break big data into four dimensions: **Volume, Velocity, Variety and Veracity**

Depending on the industry and organization, big data encompasses information from multiple internal and external sources such as transactions, social media, enterprise content, sensors and mobile devices. Companies can leverage data to adapt their products and services to better meet customer needs, optimize operations and infrastructure, and find new sources of revenue.

By 2015, **4.4 MILLION IT JOBS** will be created globally to support big data, with 1.9 million in the United States

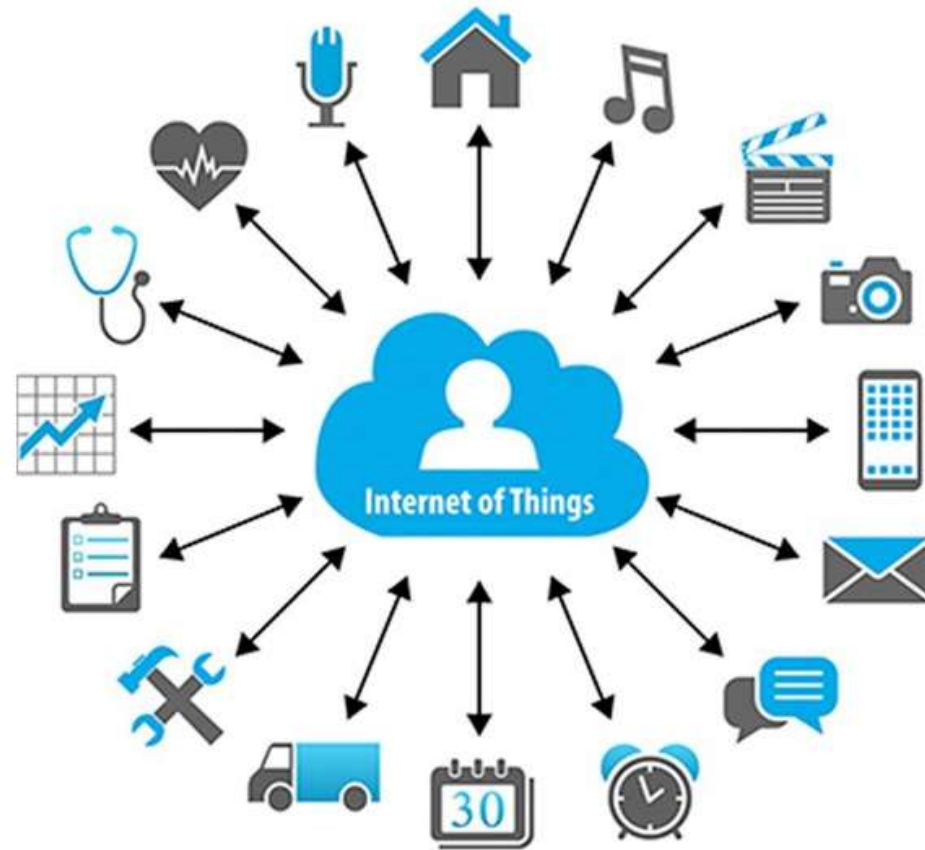


Sources: McKinsey Global Institute, Twitter, Cisco, Gartner, EMC, SAS, IBM, MEPTec, GAs

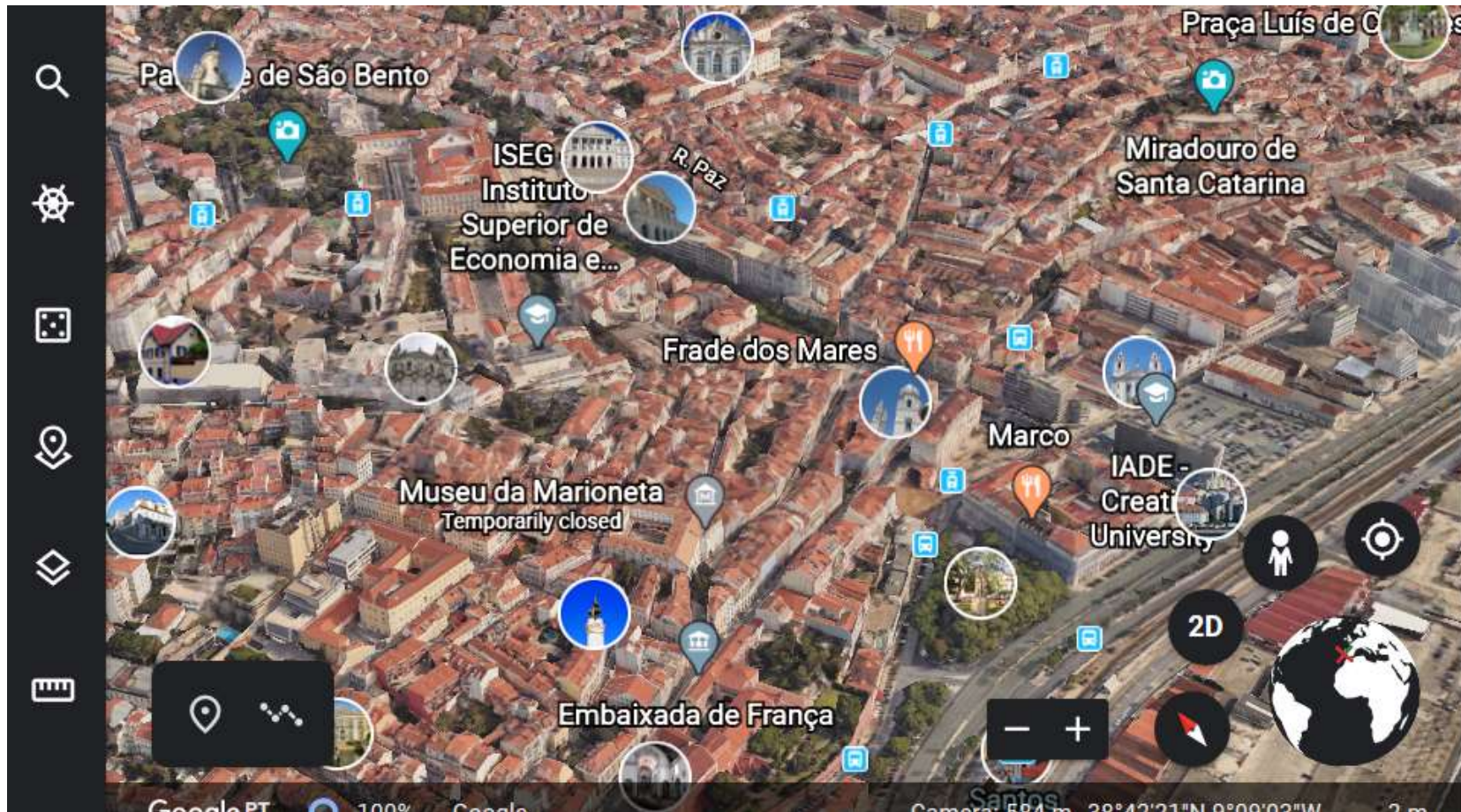




Internet of Things (IoT)



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

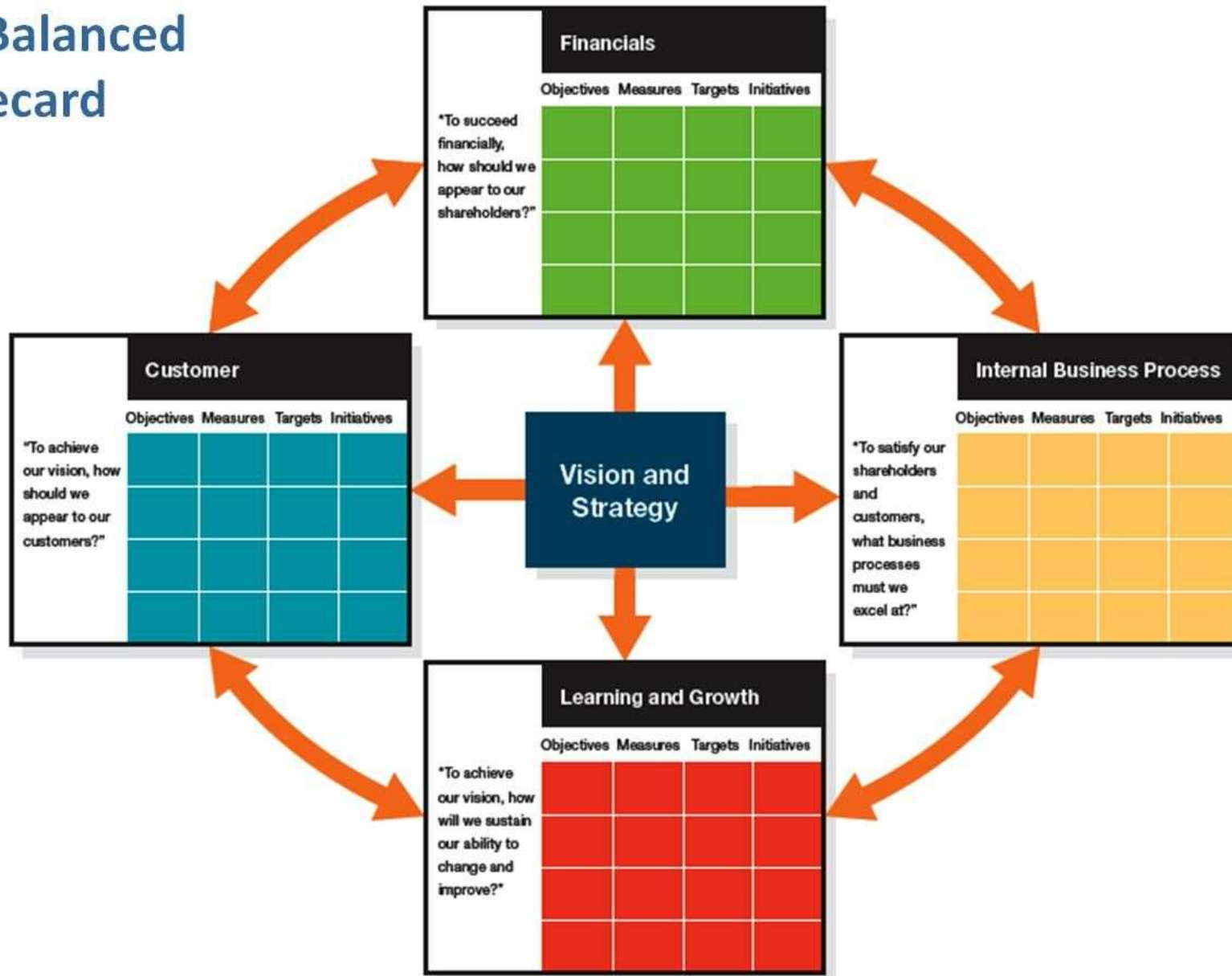
Senior managers

Managers/Staff

Business analysts

Laudon & Laudon (2012)

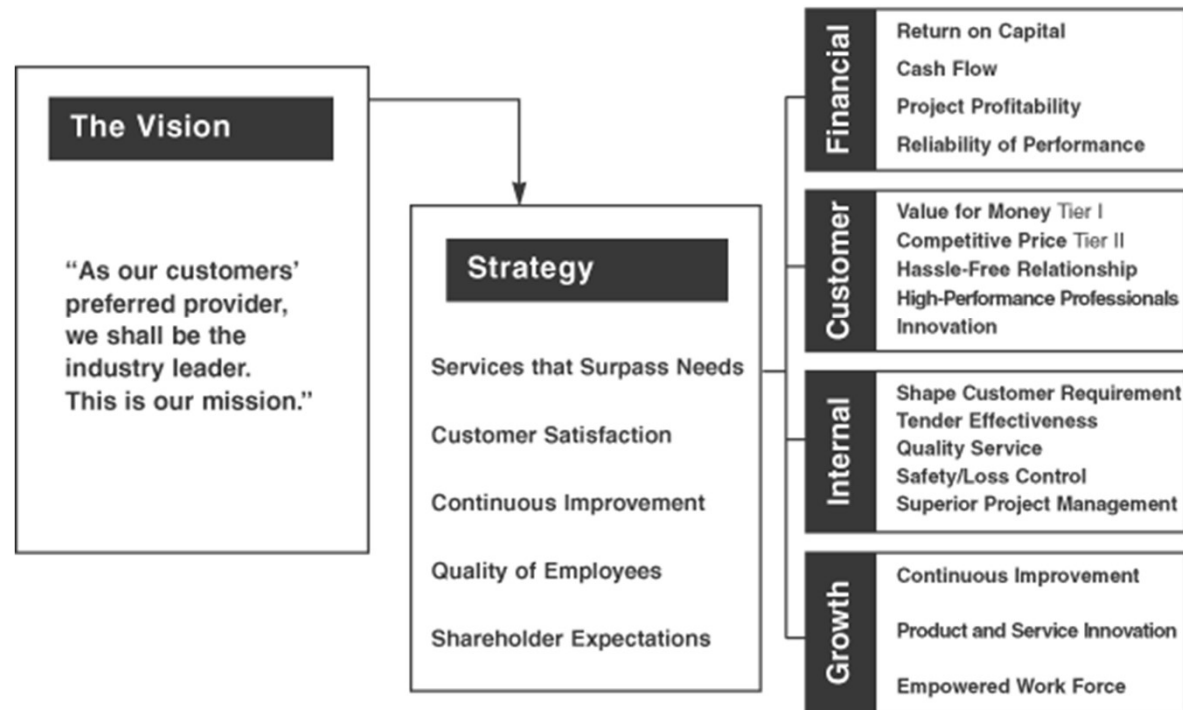
The Balanced Scorecard



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)

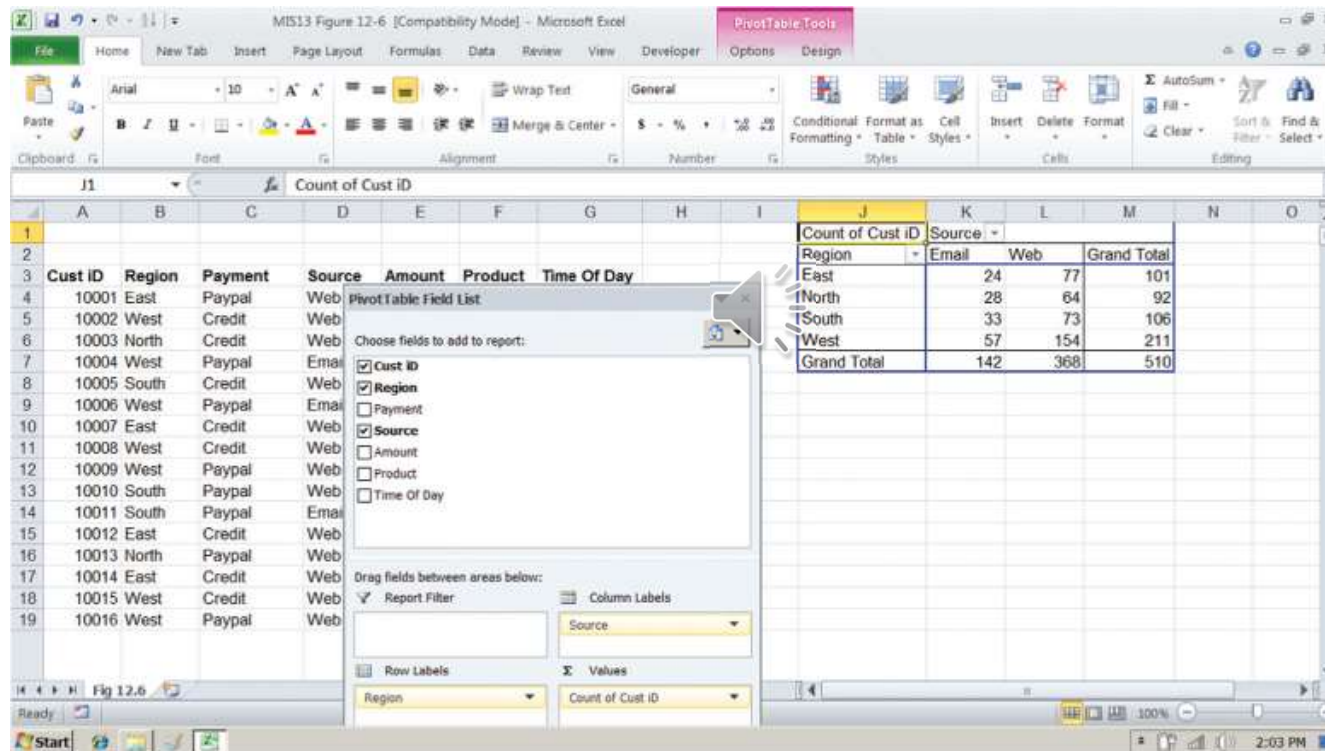
Sensitivity Analysis

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



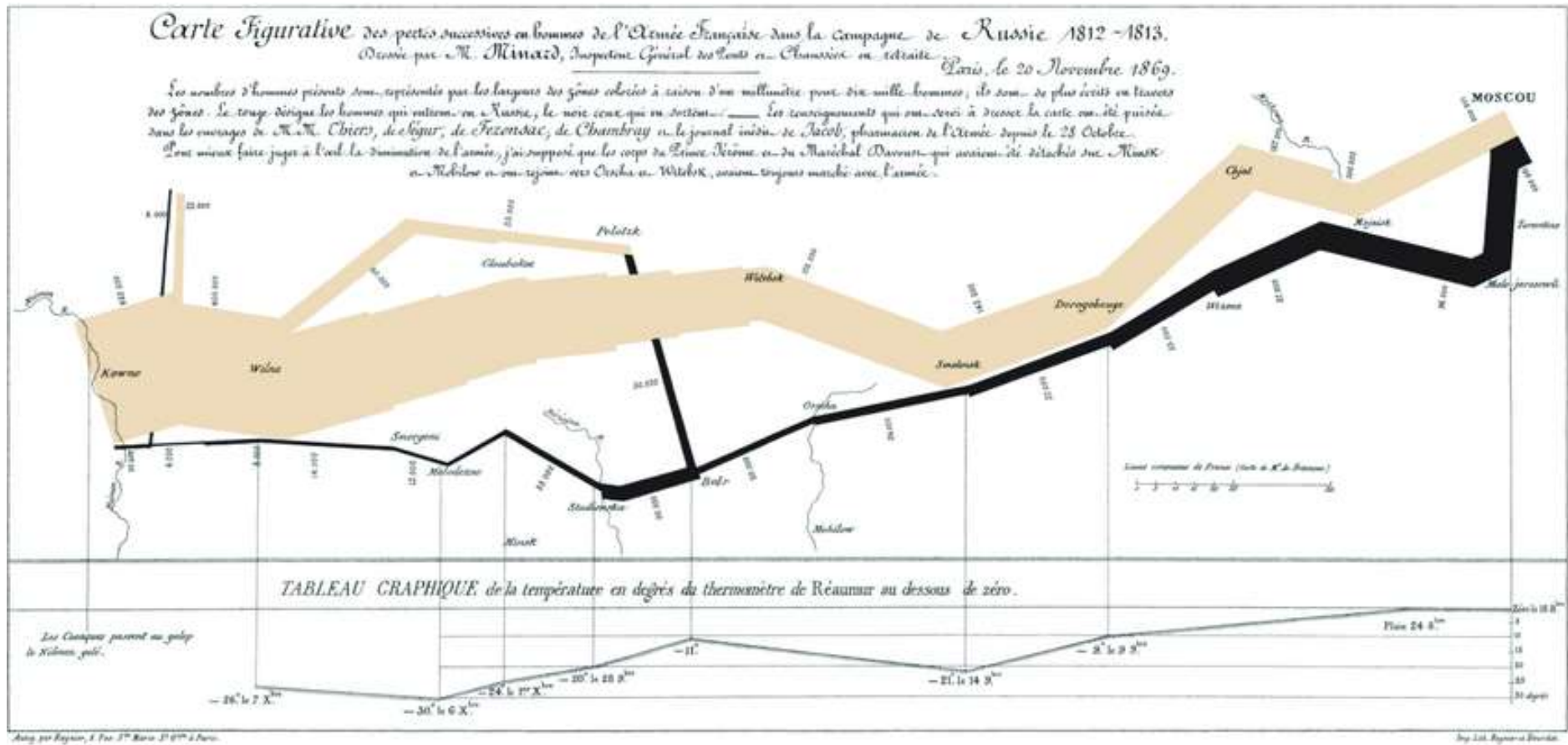


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DATA VISUALIZATION

Data visualization





Problems with data visualization

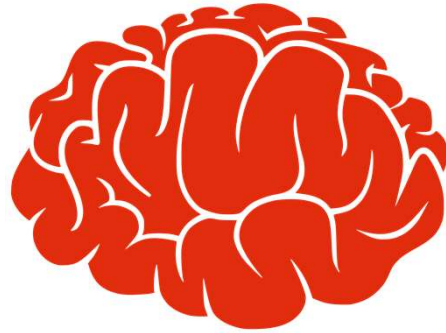


Problems with data visualization





Memory

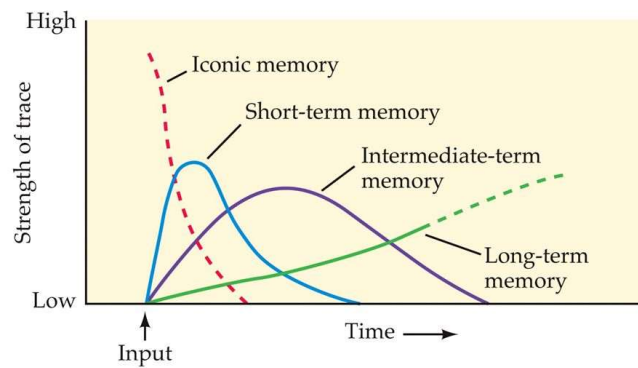


Iconic
memory

Short Term
memory

Long Term
memory

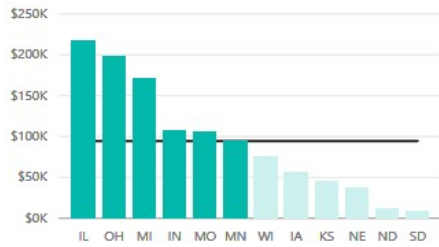
Stages of Memory Formation





Gestalt's principles

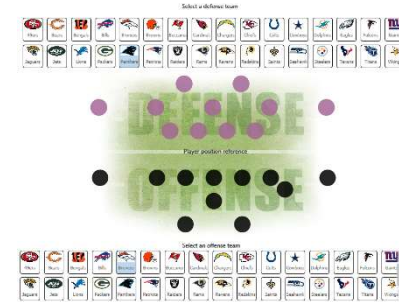
Proximity and Similarity



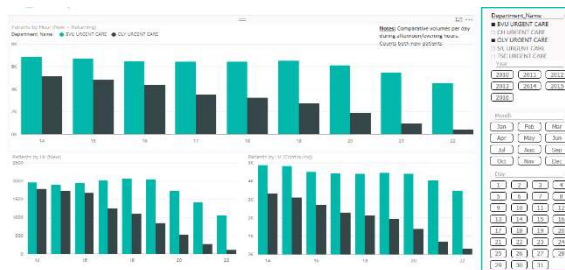
Continuity



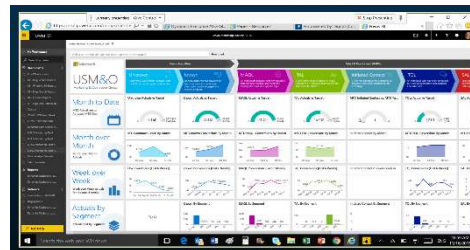
Figure-Ground



Closure and Simmetry



Simetry and continuity

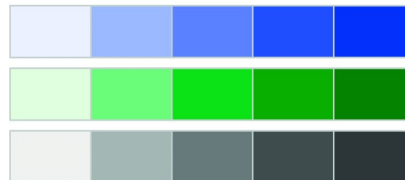


Colour

(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
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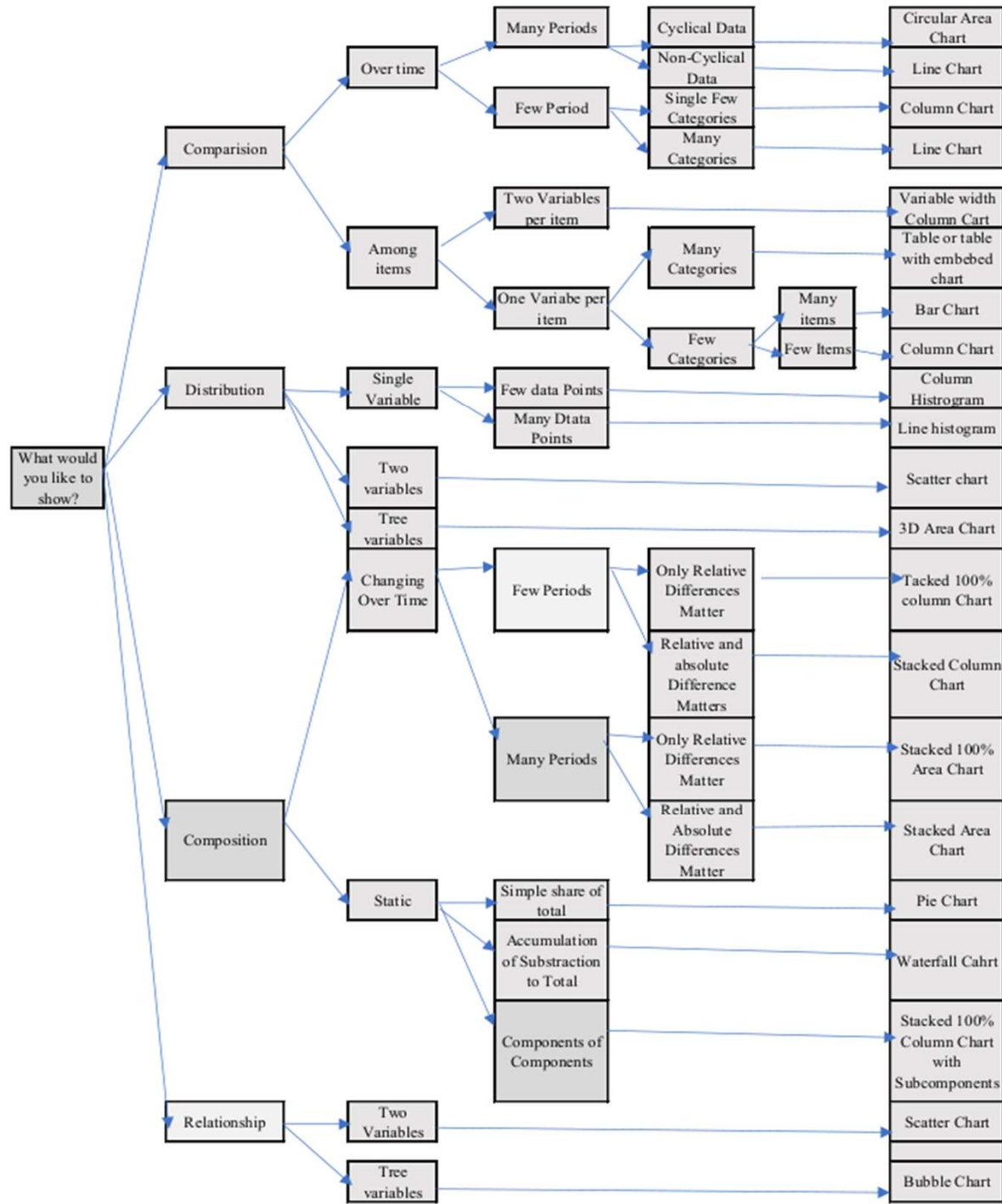
Letter spacing Word Spacing
Typography is good for design

Normal *Italic* *Oblique*
Black Bold Regular Light Thin



Good Dashboard

.i sqlbi.		The 15 Rules to Design a Perfect Dashboard			http://sql.bi/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



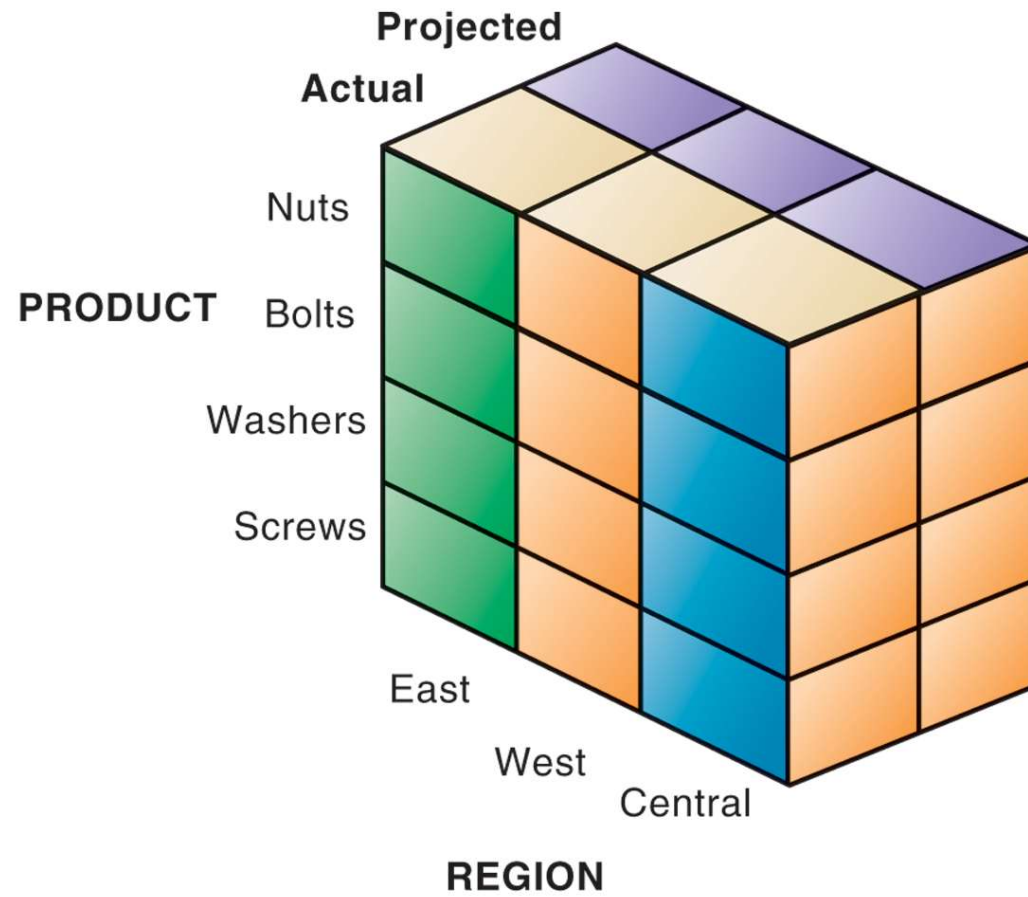


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MULTIDIMENSIONAL STRUCTURE



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



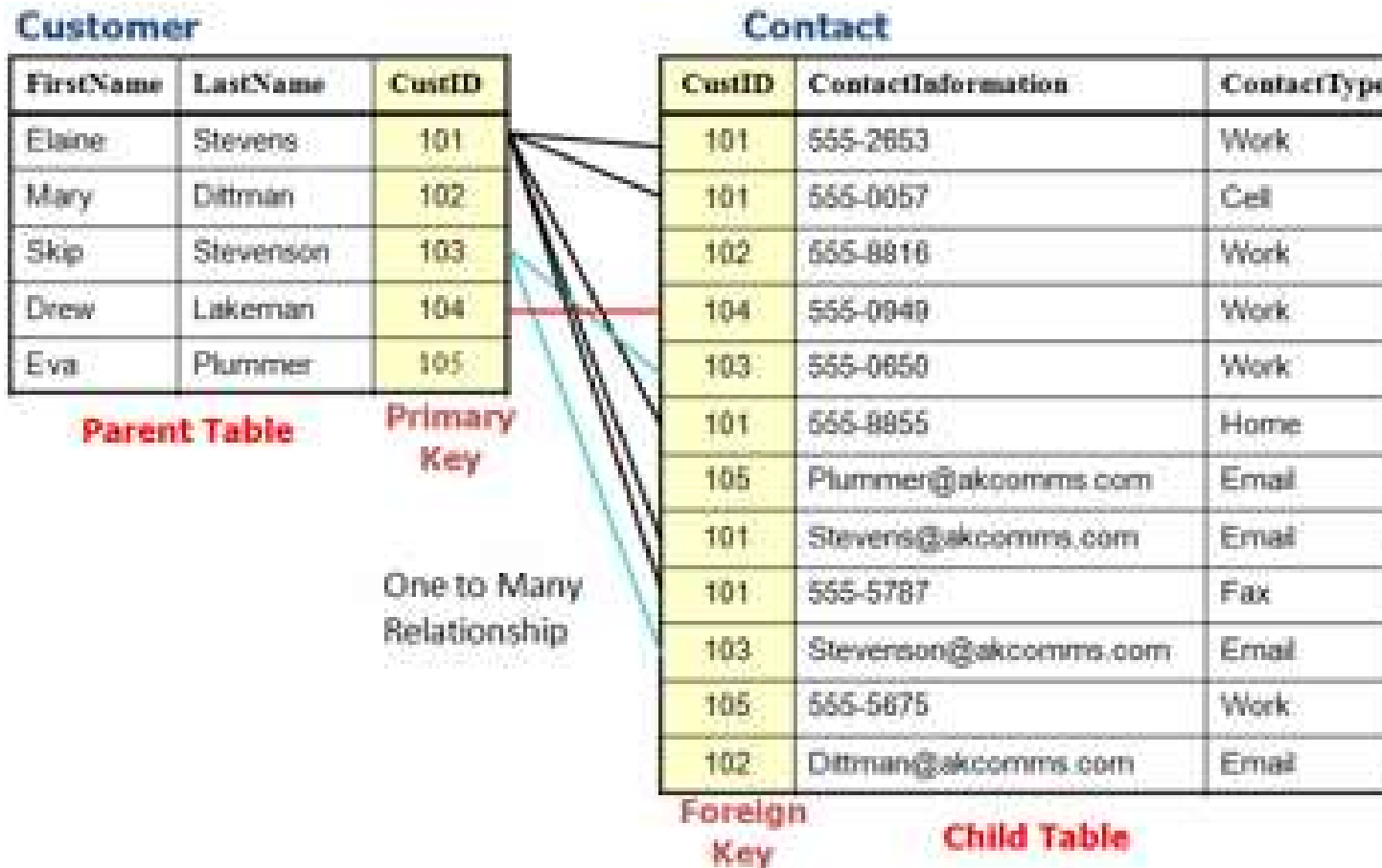
What is a Primary



CR1

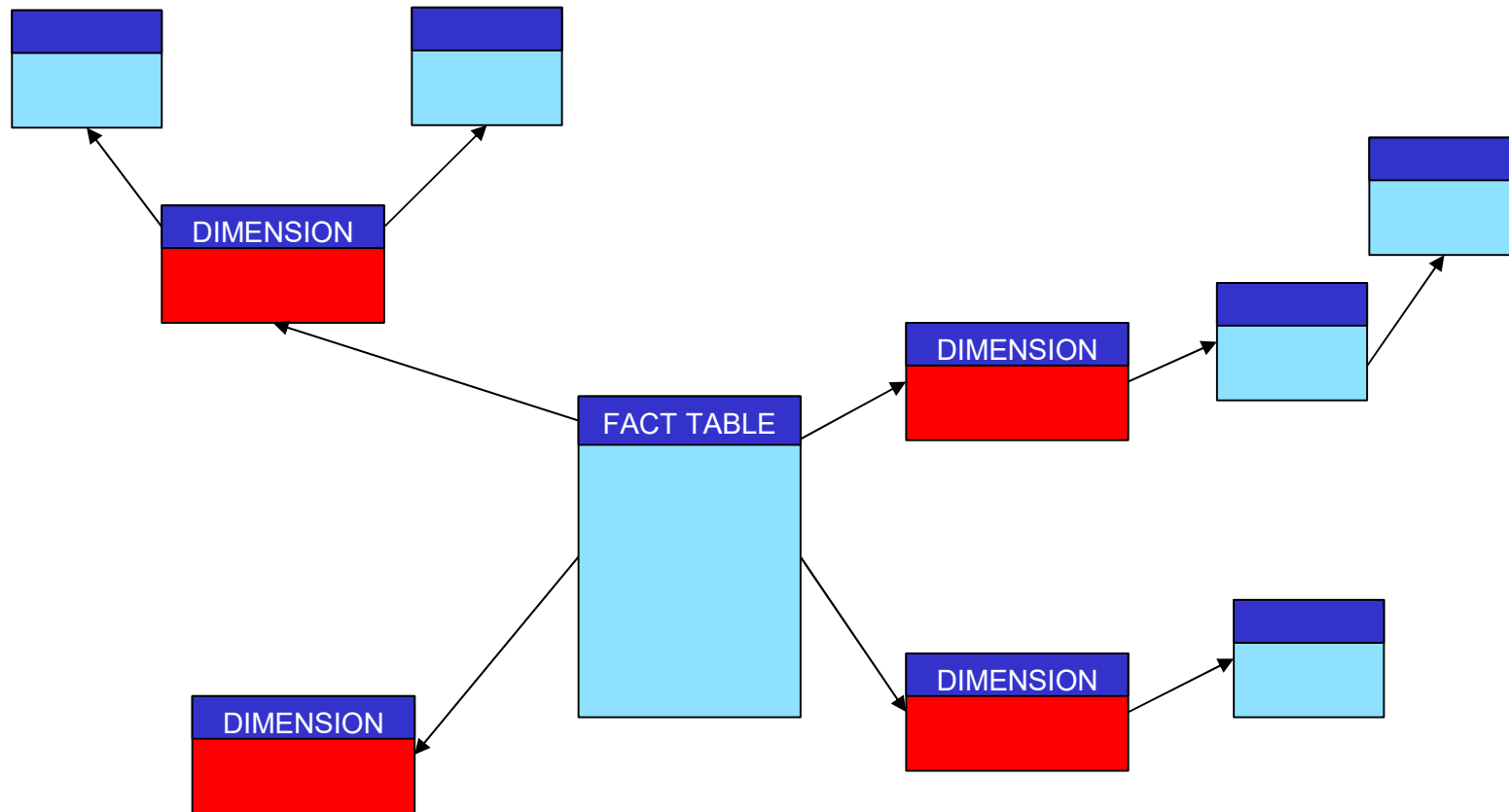


Foreign Key



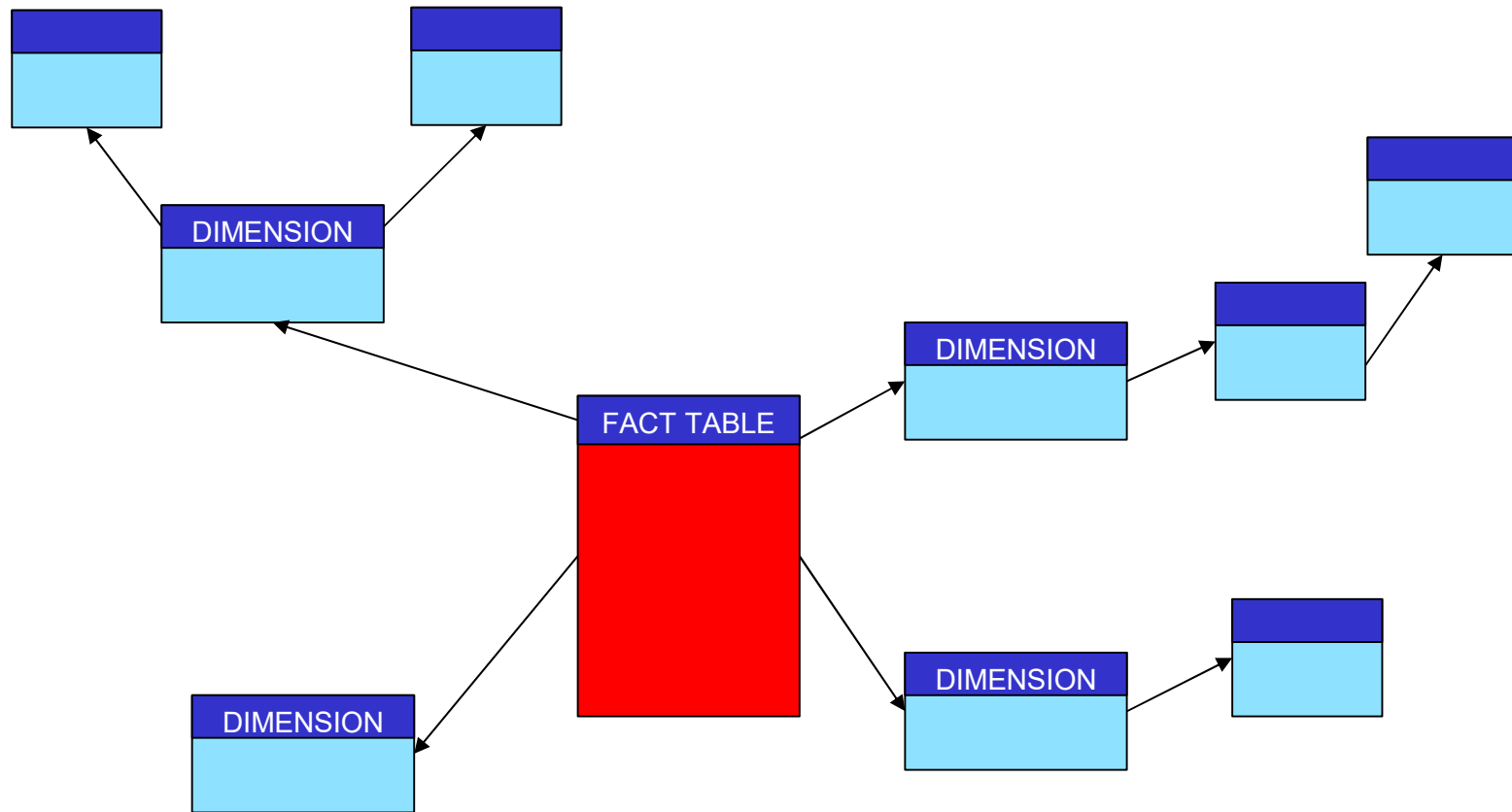


Dimension tables



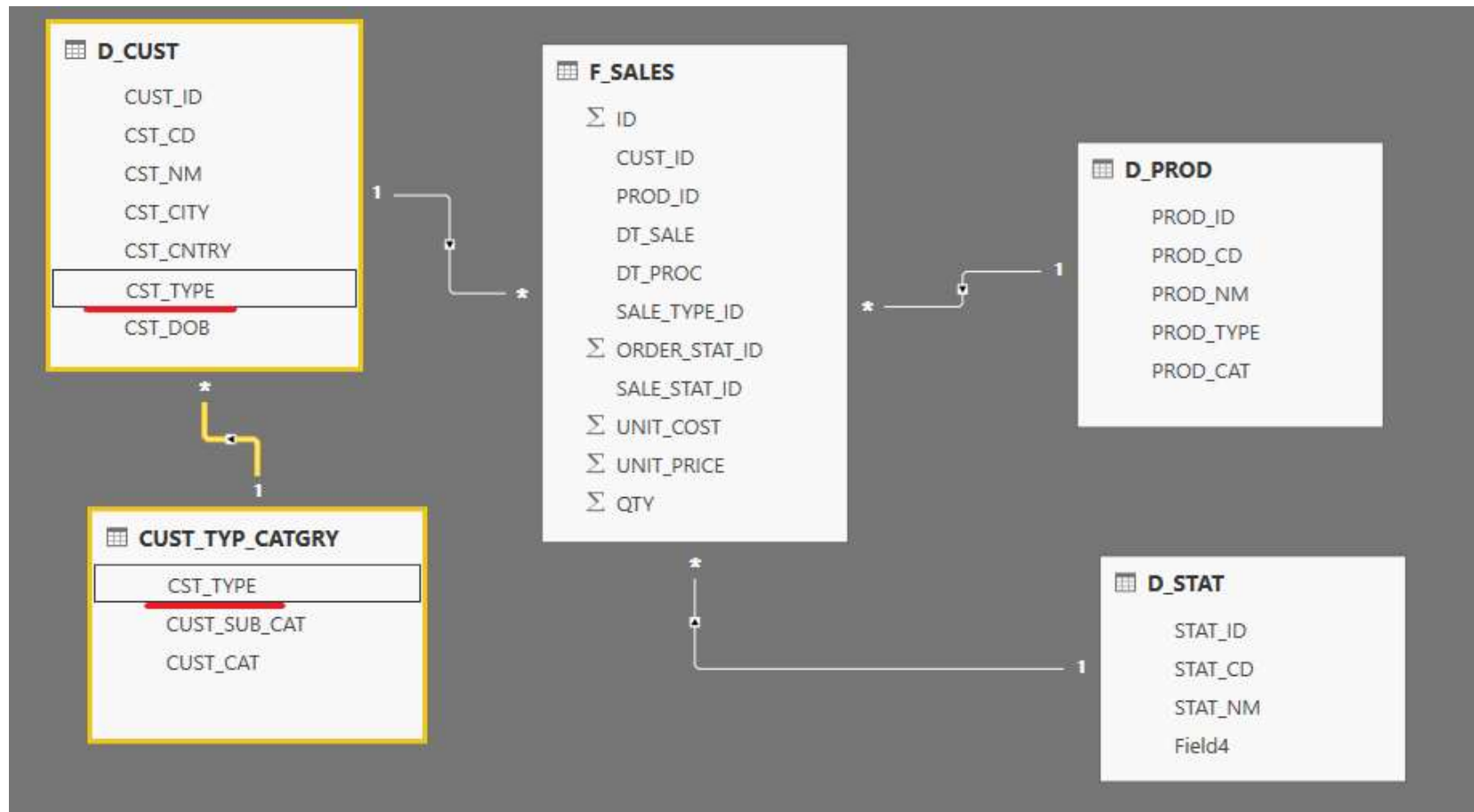


Fact Table



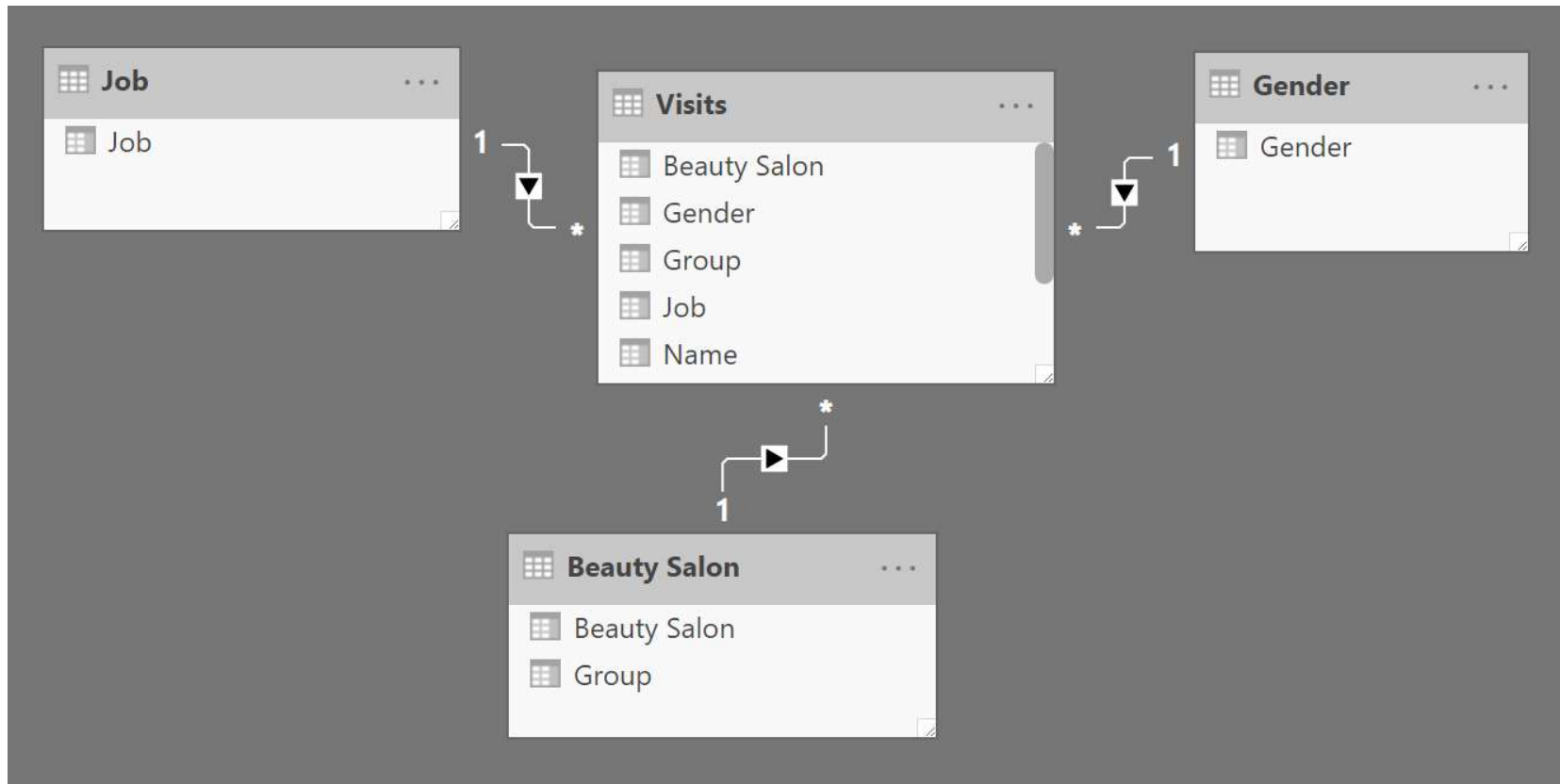


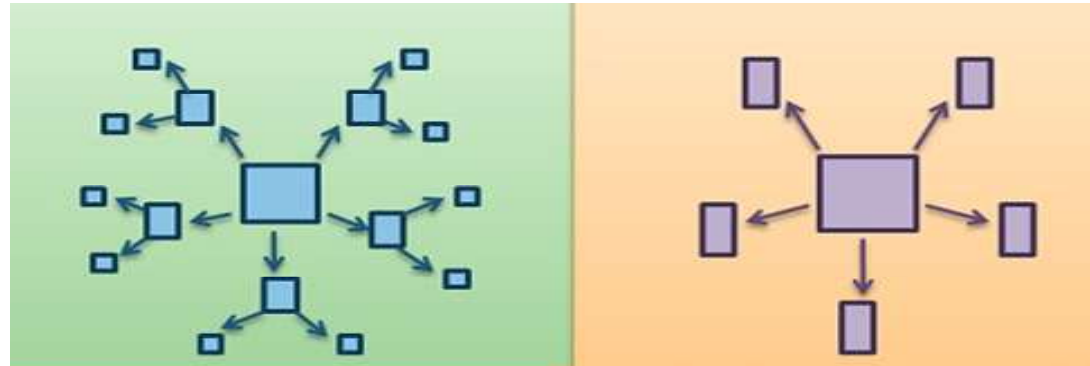
Snowflake schemas





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