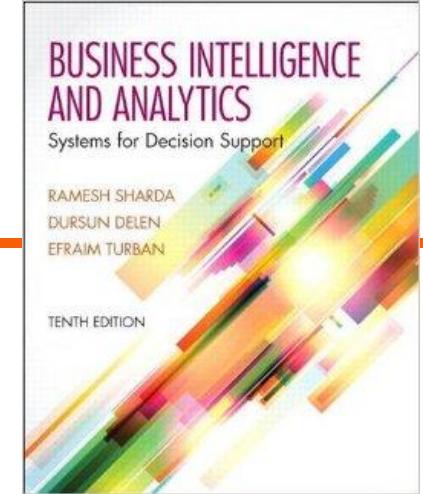
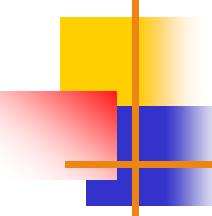


# Business Intelligence and Analytics: Systems for Decision Support (10<sup>th</sup> Edition)



## Chapter 4: Business Reporting, Visual Analytics, and Business Performance Management

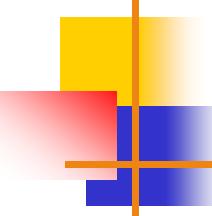


# Learning Objectives

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- Define business reporting and understand its historical evolution
- Recognize the need for and the power of business reporting
- Understand the importance of data/information visualization
- Learn different types of visualization techniques
- Appreciate the value that visual analytics brings to BI/BA
- ...

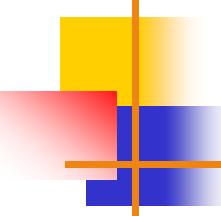
*(Continued...)*



# Learning Objectives

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- Know the capabilities and limitations of dashboards
- Understand the nature of business performance management (BPM)
- Learn the closed-loop BPM methodology
- Describe the basic elements of balanced scorecards

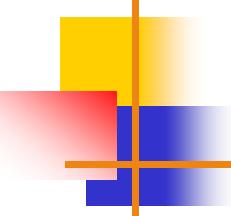


# Opening Vignette...

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## Self-Service Reporting Environment Saves Millions For Corporate Customers

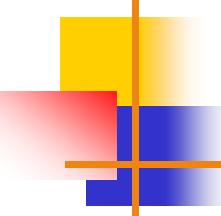
- Background
- Business Challenge
- Solution
- Results
- Answer & discuss the case questions.



# Questions for the Opening Vignette

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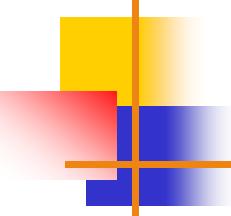
1. What does Travel and Transport, Inc., do?
2. Describe the complexity and the competitive nature of the business environment in which Travel and Transport, Inc., functions.
3. What were the main business challenges?
4. What was the solution? Implementation?
5. Why do you think a multi-vendor, multi-tool solution was implemented?
6. List and comment on three main benefits of the implemented system.



# Business Reporting Definitions and Concepts

---

- Report = Information → Decision
- Report?
  - Any communication artifact prepared to convey specific information
- A report can fulfill many functions
  - To ensure proper departmental functioning
  - To provide information
  - To provide the results of an analysis
  - To persuade others to act
  - To create an organizational memory



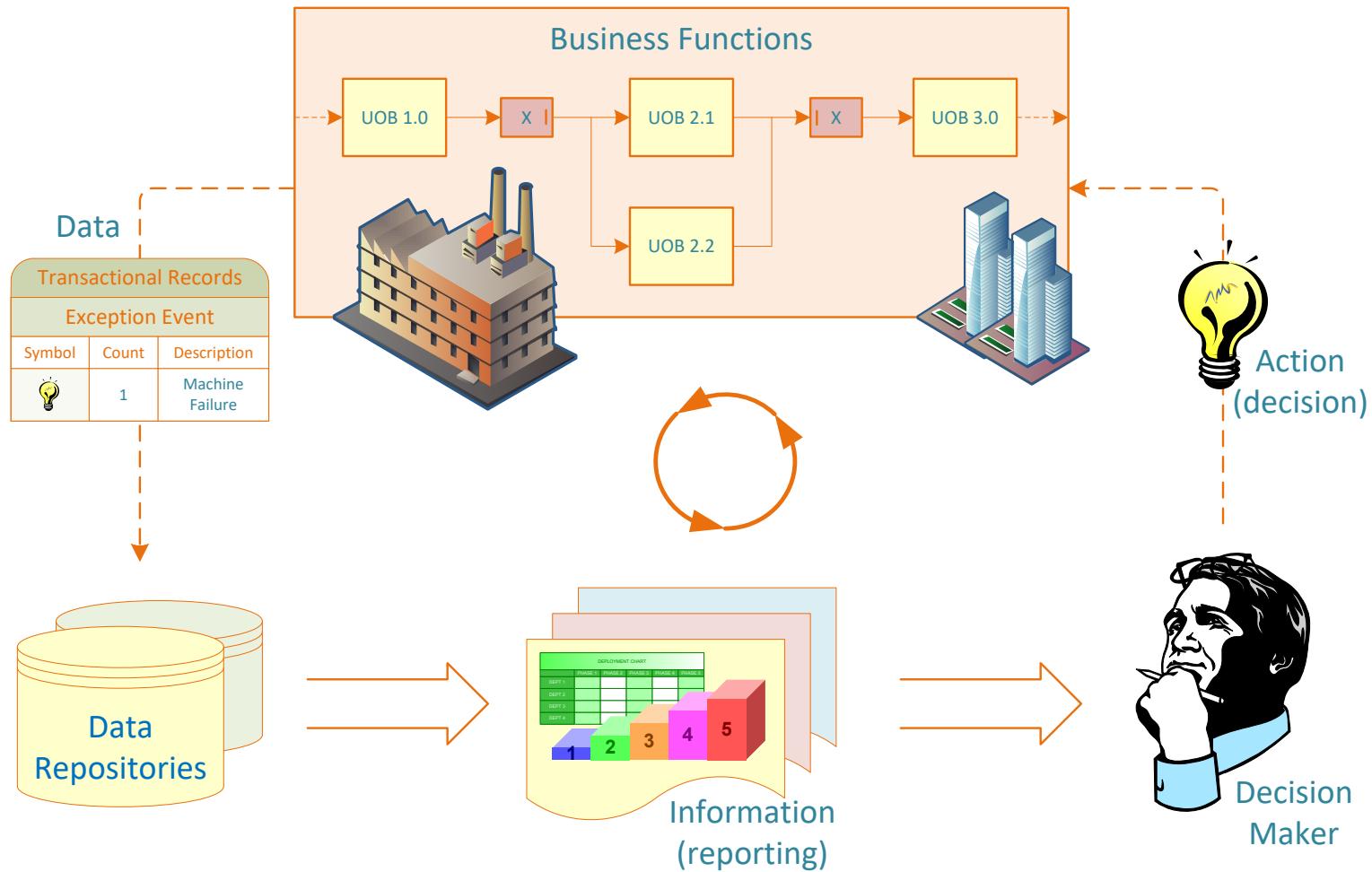
# What is a Business Report?

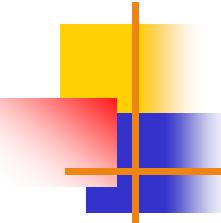
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- A written document that contains information regarding business matters.
- Purpose: to improve managerial decisions
- Source: data from inside and outside the organization (via the use of ETL)
- Format: text + tables + graphs/charts
- Distribution: in-print, email, portal/intranet

Data acquisition → Information generation →  
Decision making → Process management

# Business Reporting

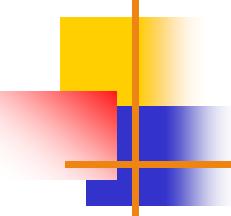




# Key to Any Successful Report

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- Clarity ...
- Brevity ...
- Completeness ...
- Correctness ...
  
- **Report types** (in terms of content and format)
  - Informal – up to 10 pages; routine and internal; follow a letter or memo format.
  - Formal – 10-100 pages; cover + summary + text; based on deep research or analytic study.
  - Short report – periodic, informative, investigative.



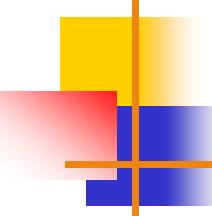
# Application Case 4.1

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## Delta Lloyd Group Ensures Accuracy and Efficiency in Financial Reporting

### Questions for Discussion

1. How did Delta Lloyd Group improve accuracy and efficiency in financial reporting?
2. What were the challenges, the proposed solution, and the obtained results?
3. Why is it important for Delta Lloyd Group to comply with industry regulations?



# Types of Business Reports

---

- Metric Management Reports

- Help manage business performance through metrics (SLAs for externals; KPIs for internals)
  - Can be used as part of Six Sigma and/or TQM

- Dashboard-Type Reports

- Graphical presentation of several performance indicators in a single page using dials/gauges

- Balanced Scorecard-Type Reports

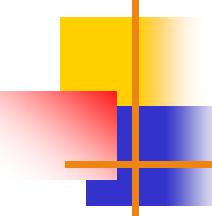
- Attempts to present an integrated view of success in an organization.
  - Include financial, customer, business process, and learning & growth indicators

# Components of Business Reporting Systems

- Seven Common Characteristics
  - OLTP (online transaction processing)
    - A system that measures some aspect of the real world as events (e.g., transactions) and records them into enterprise databases.
    - Examples: ERP, POS, SCM, RFID, Sensors, Web, ...
  - Data supply
    - A system that takes recorded events/transactions and delivers them reliably to the reporting system. The data access can be push or pull. It can also be polled (or batched periodically), or triggered (or online) in case of specific events.
  - ETL
    - This is the intermediate step where these recorded transactions/events are checked for quality, put into the appropriate format, and inserted into the desired data format.

# Components of Business Reporting Systems (Cont.)

- Data storage
  - The storage area for the data and meta data.
  - Usually: RDMS, DM, DW, ODS. Often employs OLAP functions
- Business logic
  - The explicit steps of how the recorded data are to be converted into metrics, scorecards, or dashboards.
- Publication medium
  - The systems that builds the various reports and hosts them (for users) or disseminates them (to users).
  - These systems may also provide notification, annotation, collaboration, and other services.
- Assurance
  - A good business reporting system is expected to offer a quality service to its users. This includes determining if and when the right information is to be delivered to the right people in the right way/format.



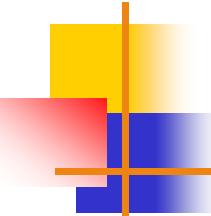
# Application Case 4.2

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## Flood of Paper Ends at FEMA

### Questions for Discussion

1. What is FEMA and what does it do?
2. What are the main challenges that FEMA faces in delivering its services?
3. How did FEMA improve its inefficient reporting practices?

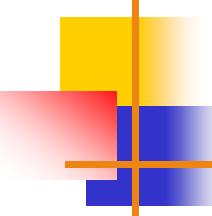


# Data and Information Visualization

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**“The use of visual representations to explore, make sense of, and communicate data.”**

- Data visualization vs. Information visualization
- Information = aggregation, summarization, and contextualization of data
- Related to the fields of information graphics, scientific visualization, and statistical graphics.
- Often includes charts, graphs, as well as the other types of visual elements used to create scorecards and dashboards.



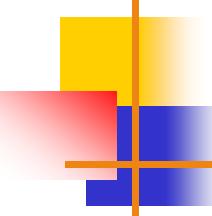
# Application Case 4.3

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## Tableau Saves Blastrac Thousands of Dollars with Simplified Information Sharing

### Questions for Discussion

1. How did Blastrac achieve significant cost saving in reporting and information sharing?
2. What were the challenge, the proposed solution, and the obtained results?

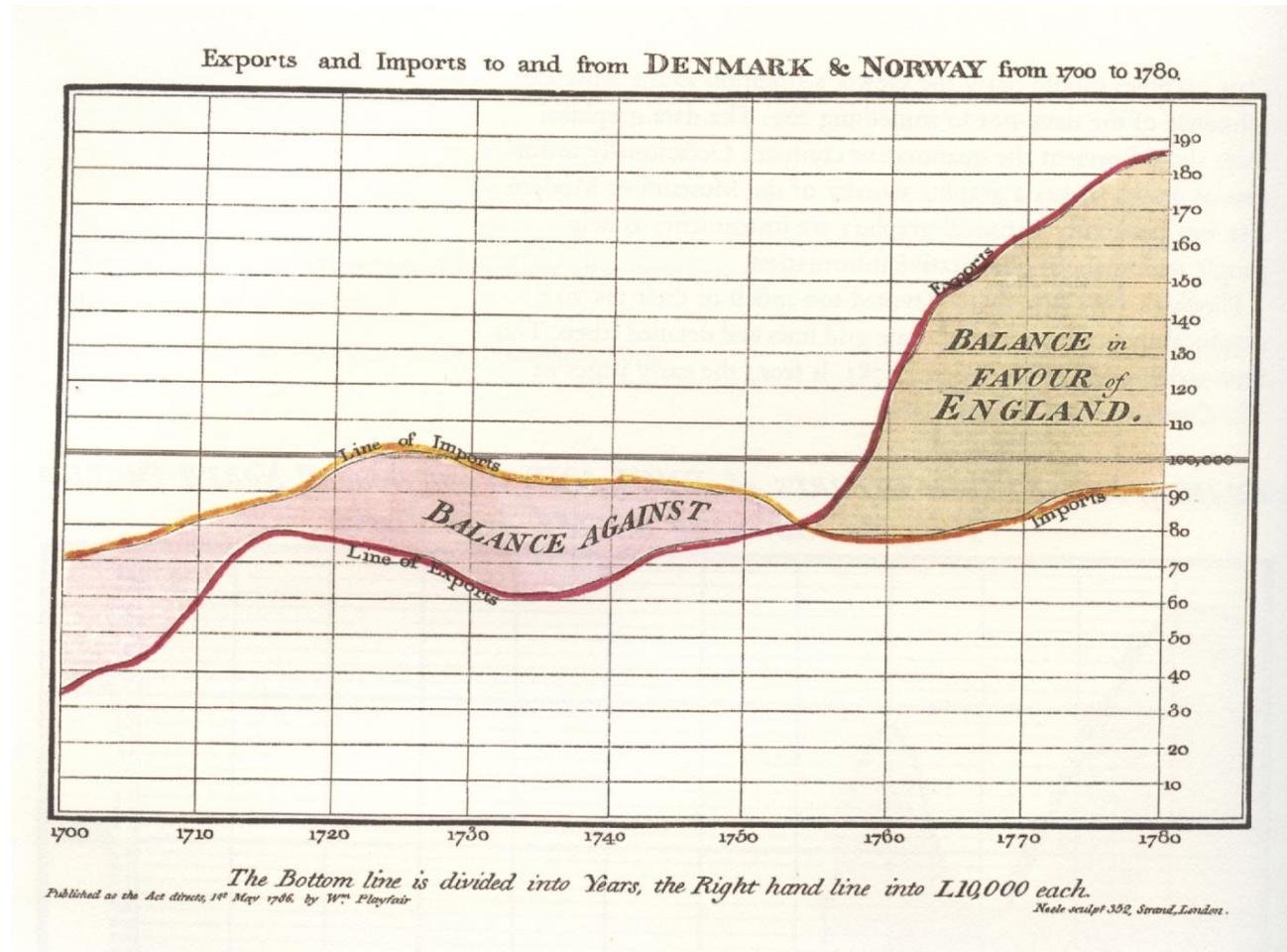


# A Brief History of Data Visualization

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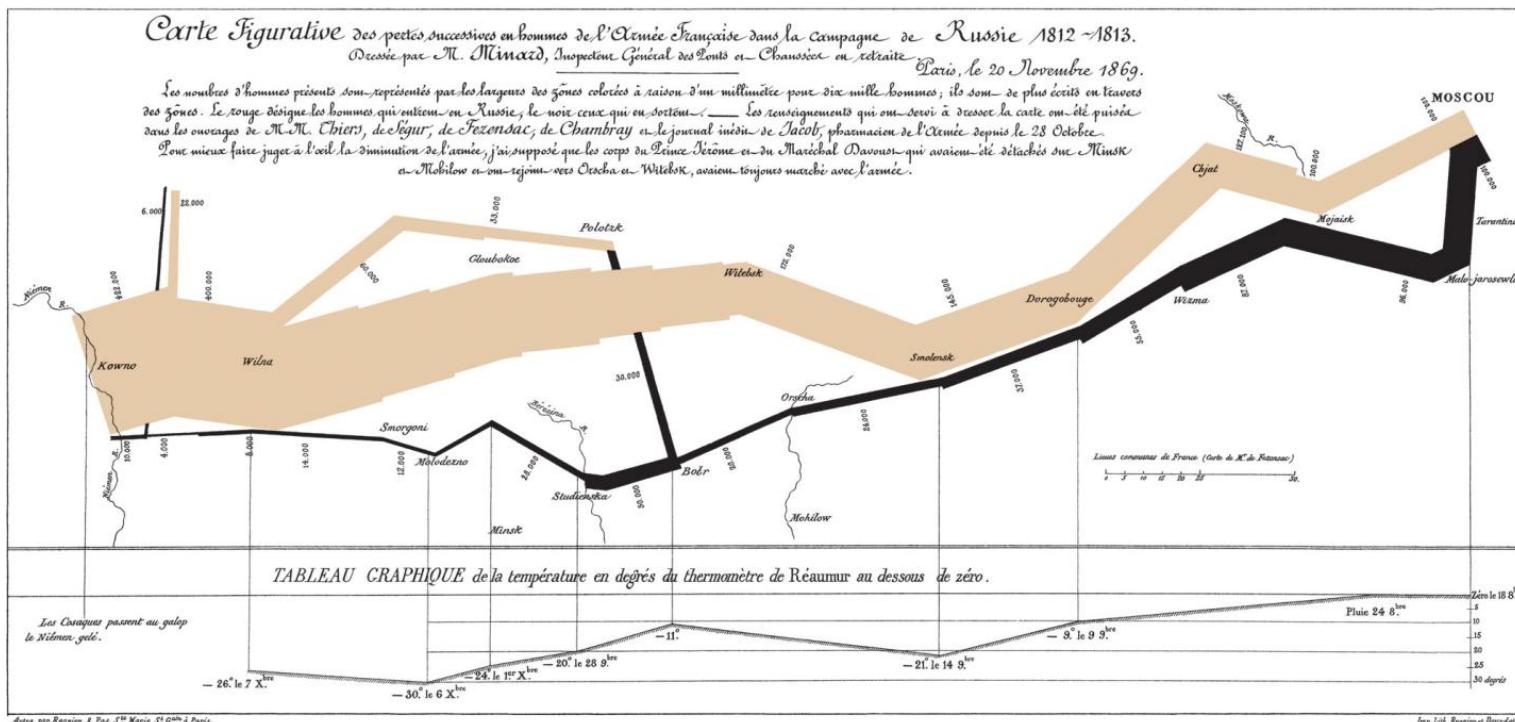
- Data visualization can date back to the second century AD
- Most developments have occurred in the last two and a half centuries
- Until recently it was not recognized as a discipline
- Today's most popular visual forms date back a few centuries
- Geographical exploration, mathematics, and popularized history spurred the creation of early maps, graphs, and timelines as far back as the 1600s
- William Playfair is widely credited as the inventor of the modern chart having created the first line and pie charts

# The First Pie Chart Created by William Playfair in 1801

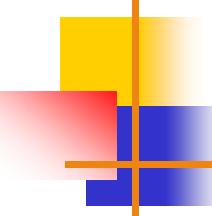


# Decimation of Napoleon's Army During the 1812 Russian Campaign

- Perhaps the most notable innovator of information graphics during this period was Charles Joseph Minard, who graphically portrayed the losses suffered by Napoleon's army in the Russian campaign of 1812



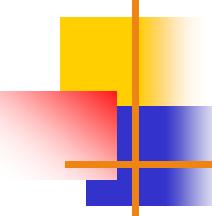
By Charles Joseph Minard



# A Brief History of Data Visualization

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- 1900s –
  - more formal attitude toward visualization
  - focus on aspects such as color, value scales, and labeling
  - Publication of the book “Semiologie Graphique”, by Jacques Bertin” (which some say serves as the theoretical foundation of modern information visualization).
- 2000s –
  - Emergence of Internet as the medium for information visualization → raising visual literacy
  - Spurred the design of new forms that incorporate interaction, animation, 3D graphics-rendering technology, virtual worlds, real-time data feed
- 2010s and beyond – ?



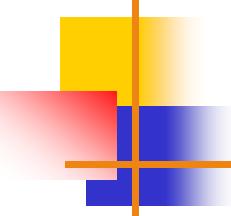
## Application Case 4.4

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### TIBCO Spotfire Provides Dana-Farber Cancer Institute with Unprecedented Insight into Cancer Vaccine Clinical Trials

#### Questions for Discussion

1. How did Dana-Farber Cancer Institute use TIBCO Spotfire to enhance information reporting and visualization?
2. What were the challenges, the proposed solution, and the obtained results?



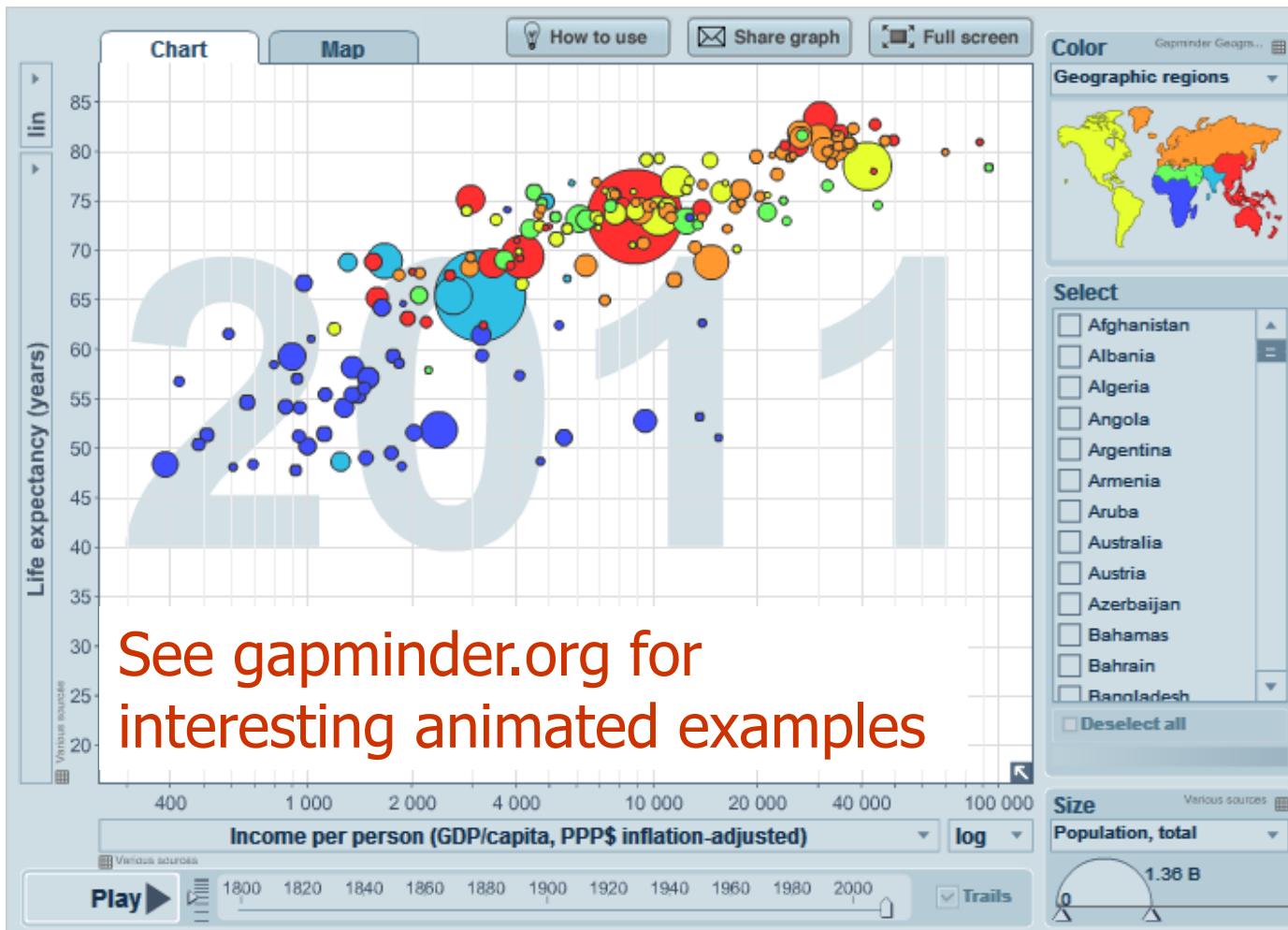
# Different Types of Charts and Graphs

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- Which one to use? Where and when?
  - Basic Charts and Graphs
    - Line Chart
    - Bar Chart
    - Pie Chart
    - Scatter Plot
    - Bubble Chart
  - Specialized Charts and Graphs
    - Histogram
    - Gantt Chart
    - PERT Chart
    - Geographic Map
    - Bullet Graph
    - Heat Map / Tree Map
    - Highlight Table

# A Gapminder Chart

## Wealth and Health of Nations



# The Emergence of Data Visualization And Visual Analytics

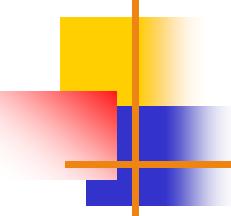
Magic Quadrant for Business Intelligence and Analytics Platforms (Source: Gartner.com)

- Many data visualization companies are in the 4<sup>th</sup> quadrant
- There is a move toward visualization

Summarizes factors such as the vendor's financial viability, market responsiveness, product development, sales channels and customer base.



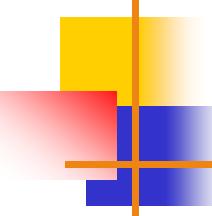
As of February 2013



# The Emergence of Data Visualization And Visual Analytics

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- Emergence of new companies
  - Tableau, Spotfire, QlikView, ...
- Increased focus by the big players
  - MicroStrategy improved Visual Insight
  - SAP launched Visual Intelligence
  - SAS launched Visual Analytics
  - Microsoft bolstered PowerPivot with Power View
  - IBM launched Cognos Insight
  - Oracle acquired Endeca



# Visual Analytics

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- A recently coined term
  - Information visualization + predictive analytics
- Information visualization
  - Descriptive, backward focused
  - “what happened” “what is happening”
- Predictive analytics
  - Predictive, future focused
  - “what will happen” “why will it happen”
- There is a strong move toward **visual analytics**

What is the difference between information visualization and visual analytics?

# Visual Analytics by SAS Institute

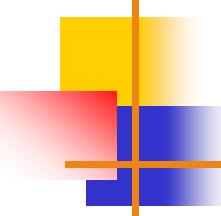


- **SAS Visual Analytics Architecture**
  - Big data + In memory + Massively parallel processing + ..

# Visual Analytics by SAS Institute

- At [teradatauniversitynetwork.com](http://teradatauniversitynetwork.com), you can learn more about SAS VA, experiment with the tool





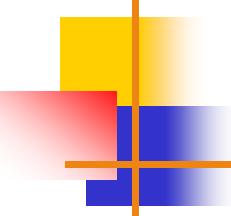
# Performance Dashboards

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- Performance dashboards are commonly used in BPM software suites and BI platforms
- Dashboards provide visual displays of important information that is consolidated and arranged on a single screen so that information can be digested at a single glance and easily drilled in and further explored

# Performance Dashboards



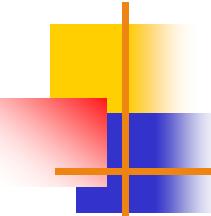


# Performance Dashboards (Dashboard design)

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- Three layer of information
  - **Monitoring.** Graphical, abstracted data to monitor KPIs.
  - **Analysis.** Summarized dimensional data to analyze the root cause of problems.
  - **Management.** Detailed operational data that identify what actions to take to resolve a problem.

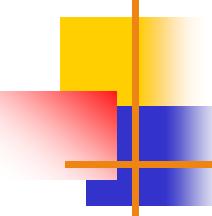
The fundamental challenge of dashboard design is to display all the required information on a single screen, clearly and without distraction, in a manner that can be assimilated quickly



# Performance Dashboards

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- To speed assimilation of the numbers, the numbers need to be placed in context. This can be done by comparing the numbers of interest to other baseline or target numbers.
  
- Some of the common comparisons that are typically made in business intelligence systems include comparisons against:
  - past values,
  - forecasted values,
  - targeted values,
  - benchmark or average values,
  - multiple instances of the same measure, and
  - the values of other measures (e.g. , revenues versus costs).



# Application Case 4.6

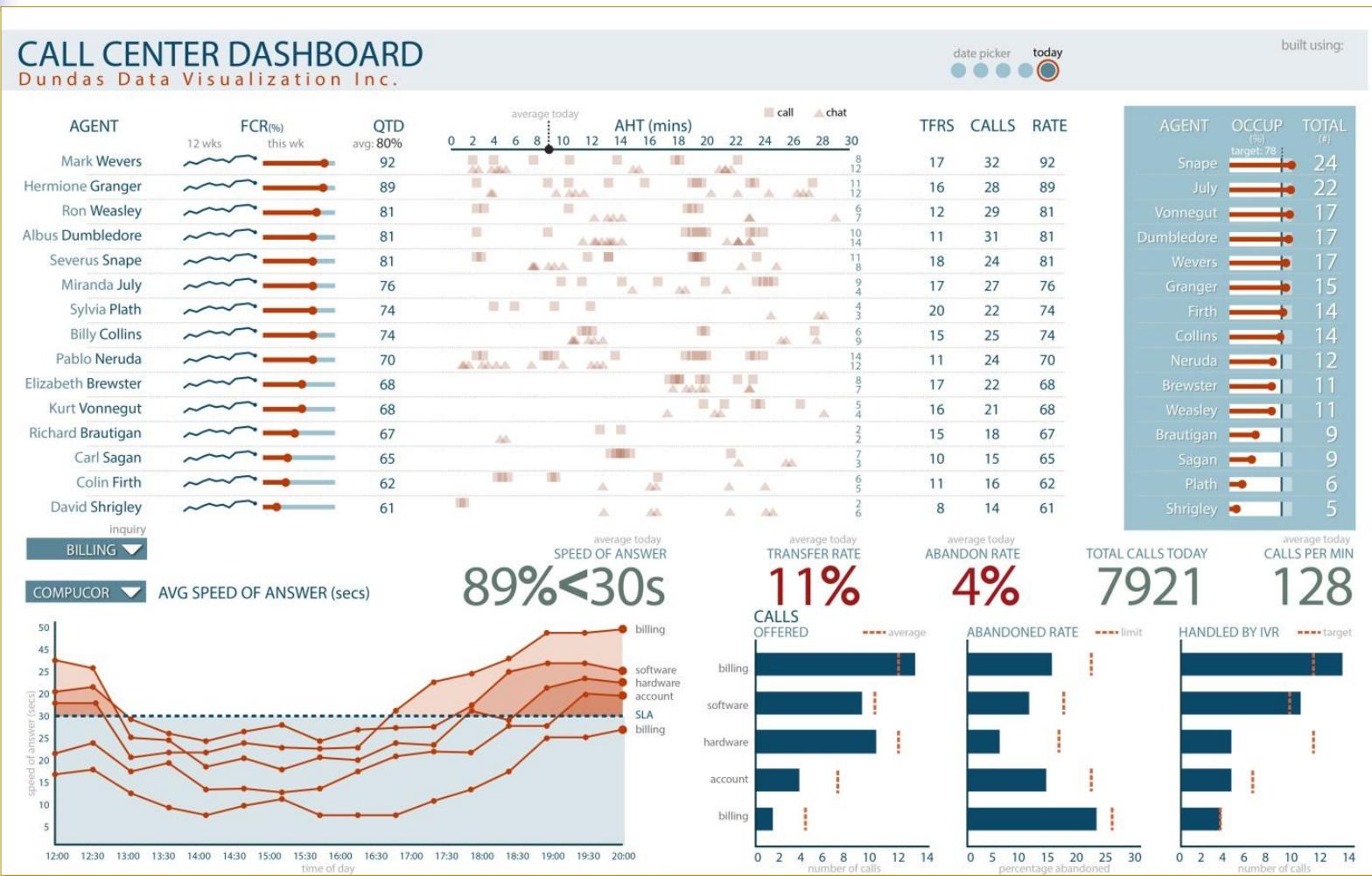
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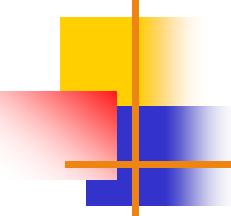
## Saudi Telecom Company Excels with Information Visualization

### Questions for Discussion

1. Why do you think telecommunication companies are among the prime users of information visualization tools?
2. How did Saudi Telecom use information visualization?
3. What were their challenges, the proposed solution, and the obtained results?

# Application Case 4.6

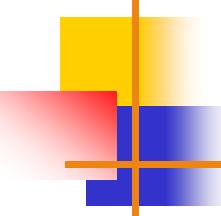




# Performance Dashboards

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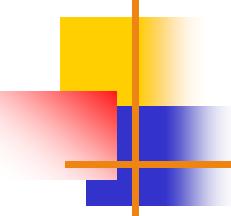
- All well-designed dashboard and other information visualizations possess the following characteristics
  - They use visual components (e.g., charts, performance bars, sparklines, gauges, meters, stoplights) to highlight data and exceptions that require action.
  - Transparent to the user, meaning that they require minimal training and are extremely easy to use
  - Combine data from a variety of systems into a single, summarized, unified view of the business
  - Enable drill-down or drill-through to underlying data sources or reports
  - Present a dynamic, real-world view with timely data
  - Require little coding to implement/deploy/maintain



# Best Practices in Dashboard Design

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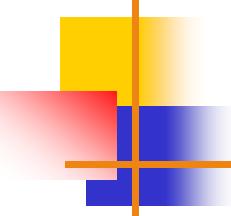
- Benchmark KPIs with Industry Standards
- Wrap the Metrics with Contextual Metadata
- Validate the Design by a Usability Specialist
- Prioritize and Rank Alerts and Exceptions
- Enrich Dashboard with Business-User Comments
- Present Information in Three Different Levels
- Pick the Right Visual Constructs
- Provide for Guided Analytics



# Business Performance Management (BPM)

---

- Business Performance Management (BPM) is...  
A real-time system that alerts managers to potential opportunities, impending problems and threats, and then empowers them to react through models and collaboration.
- Also called corporate performance management (CPM by Gartner Group), enterprise performance management (EPM by Oracle), strategic enterprise management (SEM by SAP)

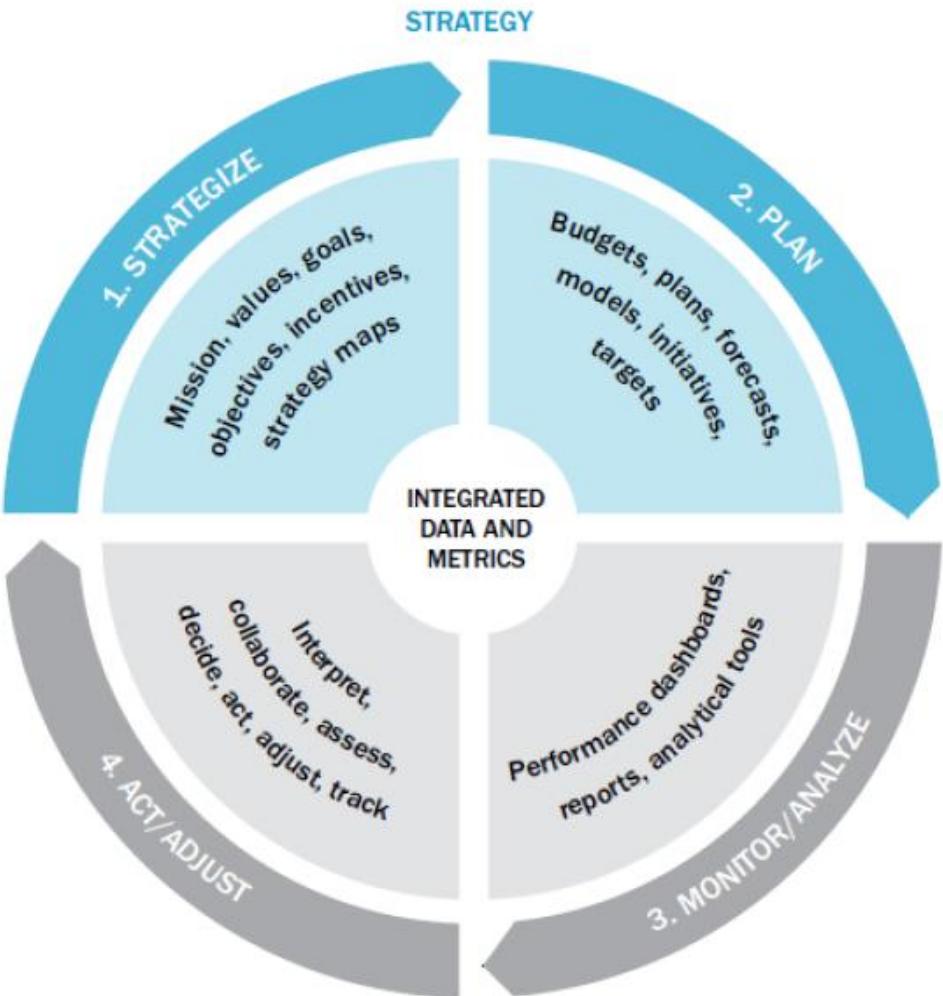


# Business Performance Management (BPM)

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- BPM refers to the business processes, methodologies, metrics, and technologies used by enterprises to measure, monitor, and manage business performance.
- BPM encompasses three key components
  - A set of integrated, closed-loop management and analytic processes, supported by technology that addresses financial as well as operational activities.
  - Tools for businesses to define strategic goals and then measure/manage performance against them
  - A core set of processes, including financial and operational planning, consolidation and reporting, modeling, analysis, and monitoring of key performance indicators (KPIs), linked to organizational strategy

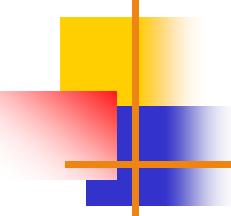
# A Closed-Loop Process to Optimize Business Performance



## ■ Process Steps

1. Strategize
2. Plan
3. Monitor/analyze
4. Act/adjust

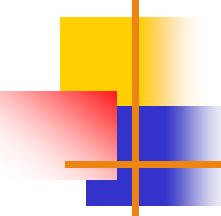
Each with its own process steps



# Strategize: Where Do We Want to Go?

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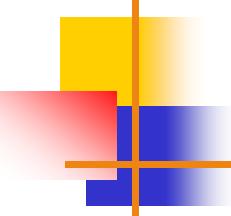
- Strategic planning
  - Common tasks for the strategic planning process:
    1. Conduct a current situation analysis
    2. Determine the planning horizon
    3. Conduct an environment scan
    4. Identify critical success factors
    5. Complete a gap analysis
    6. Create a strategic vision
    7. Develop a business strategy
    8. Identify strategic objectives and goals



# Plan: How Do We Get There?

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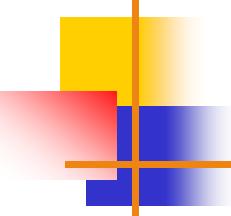
- Operational planning
  - **Operational plan:** plan that translates an organization's strategic objectives and goals into a set of well-defined tactics and initiatives, resources requirements, and expected results for some future time period (usually a year).
- Operational planning can be
  - Tactic-centric (operationally focused)
  - Budget-centric plan (financially focused)



# Monitor/Analyze: How Are We Doing?

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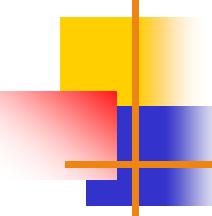
- A comprehensive framework for monitoring performance should address two key issues:
  - What to monitor?
    - Critical success factors
    - Strategic goals and targets
    - ...
  - How to monitor?
    - ...



# Act and Adjust: What Do We Need to Do Differently?

---

- Success (or mere survival) depends on new projects: creating new products, entering new markets, acquiring new customers (or businesses), or streamlining some process.
- Many new projects and ventures fail!
- What is the chance of failure?
  - 60% of Hollywood movies fail
  - 70% of large IT projects fail, ...



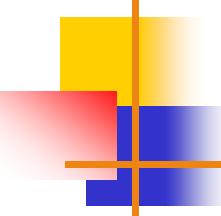
# Application Case 4.7

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## IBM Cognos Express Helps Mace for Faster and Better Business Reporting

### Questions for Discussion

1. What was the reporting challenge Mace was facing? Do you think this is an unusual challenge specific to Mace?
2. What was the approach for a potential solution?
3. What were the results obtained in the short term, and what were the future plans?



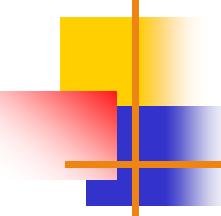
# Performance Measurement

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## ■ **Performance measurement system**

A system that assists managers in tracking the implementations of business strategy by comparing actual results against strategic goals and objectives

- Comprises systematic comparative methods that indicate progress (or lack thereof) against goals



# KPIs and Operational Metrics

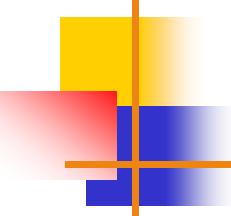
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- **Key performance indicator (KPI)**

A KPI represents a strategic objective and metrics that measure performance against a goal

- Distinguishing features of KPIs

- Strategy
- Targets
- Ranges
- Encodings
- Time frames
- Benchmarks



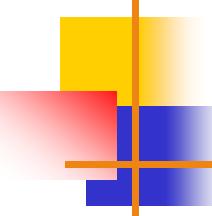
# Performance Measurement

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- **Key performance indicator (KPI)**

Outcome KPIs (lagging indicators e.g., revenues)	vs.	Driver KPIs (leading indicators e.g., sales leads)
--------------------------------------------------------	-----	----------------------------------------------------------

- Operational areas covered by driver KPIs
  - Customer performance
  - Service performance
  - Sales operations
  - Sales plan/forecast



# Performance Measurement System

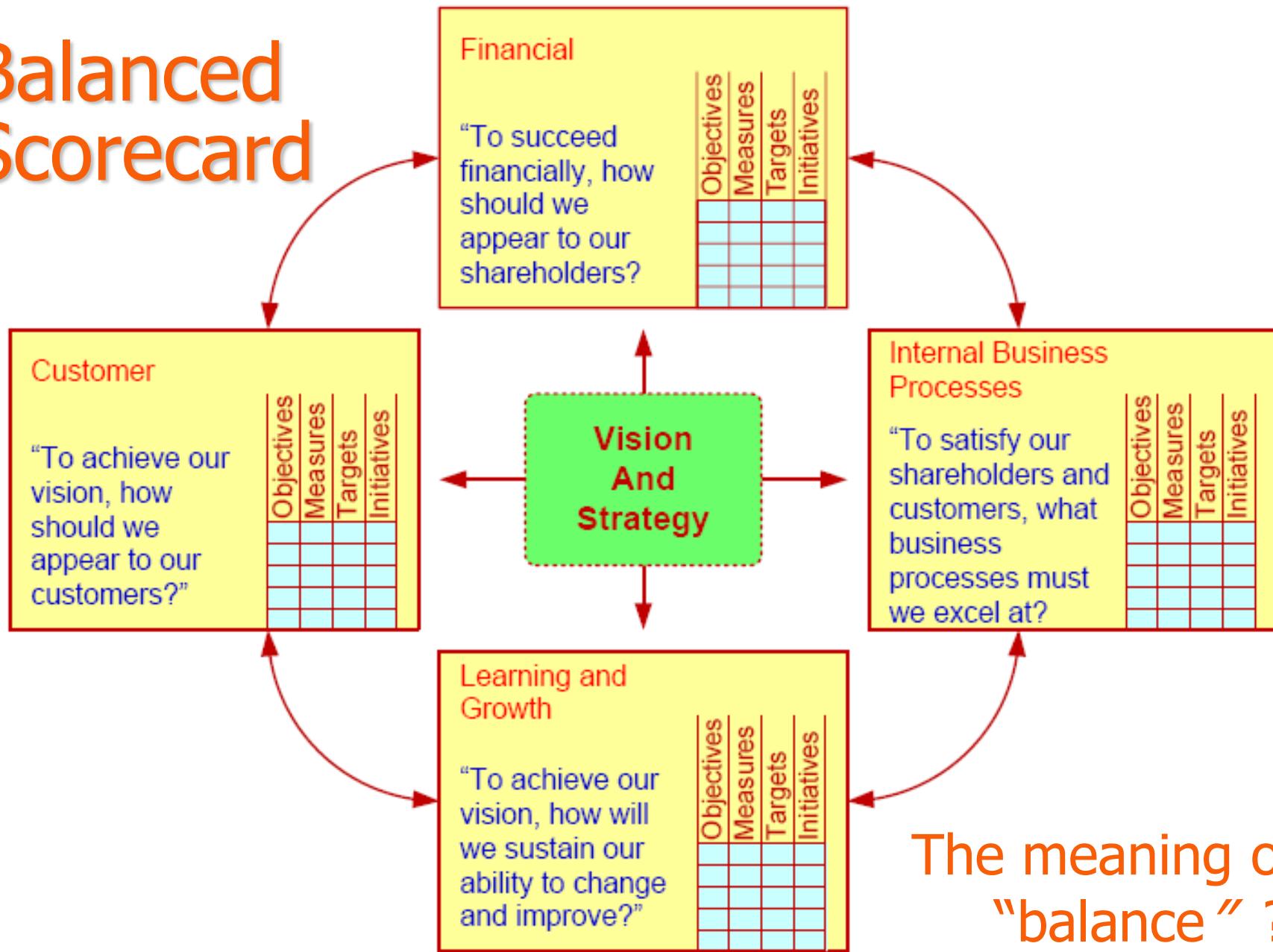
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- **Balanced Scorecard (BSC)**

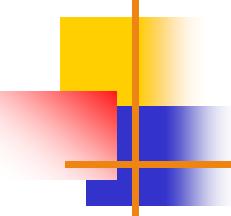
A performance measurement and management methodology that helps translate an organization's financial, customer, internal process, and learning and growth objectives and targets into a set of actionable initiatives

**"The Balanced Scorecard: Measures That Drive Performance"** *(HBR, 1992)*

# Balanced Scorecard



# The meaning of “balance” ?

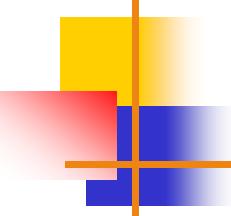


# Six Sigma as a Performance Measurement System

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- **Six Sigma**

A performance management methodology aimed at reducing the number of defects in a business process to as close to zero defects per million opportunities (DPMO) as possible



# Six Sigma as a Performance Measurement System

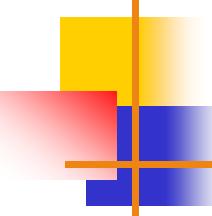
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- The DMAIC performance model
  - A closed-loop business improvement model that encompasses the steps of defining, measuring, analyzing, improving, and controlling a process
- Lean Six Sigma
  - Lean manufacturing / lean production
  - Lean production versus six sigma?

# Comparison of Balanced Scorecard and Six Sigma

**TABLE 4.1** Comparison of Balanced Scorecard and Six Sigma

Balanced Scorecard	Six Sigma
Strategic management system	Performance measurement system
Relates to the longer-term view of the business	Provides snapshot of business's performance and identifies measures that drive performance toward profitability
Designed to develop balanced set of measures	Designed to identify a set of measurements that impact profitability
Identifies measurements around vision and values	Establishes accountability for leadership for wellness and profitability
Critical management processes are to clarify vision/strategy, communicate, plan, set targets, align strategic initiatives, and enhance feedback	Includes all business processes—management and operational
Balances customer and internal operations without a clearly defined leadership role	Balances management and employees' roles; balances costs and revenue of heavy processes



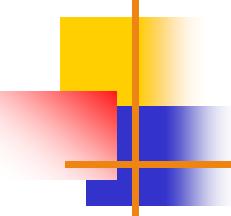
# Application Case 4.8

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## Expedia.com's Customer Satisfaction Scorecard

### Questions for Discussion

1. Who are the customers for Expedia.com? Why is customer satisfaction a very important part of their business?
2. How did Expedia.com improve customer satisfaction with scorecards?
3. What were the challenges, the proposed solution, and the obtained results?



# End of the Chapter

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- Questions, comments



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