TDT4175 - Information Systems

NOTES

Dusan Jakovic

H19

[01] Introduction to Information Systems (IS) 7
Digitalization 8
Data, Information, and Knowledge 8
Data 8
Information 9
Process 9
Knowledge 9
Types of data 9
The Dimensions of Valuable Information 9
Deploying Information Systems 10
IS Types 10
Electronic and Mobile Commerce 11
Enterprise Systems 12
Business Intelligence and Analytics 12
Business intelligence (BI) 12
Business analytics 12
Big data analytics 12
System Acquisition and Development 13

[02] Information Systems in Organizations 14
Miles and Snow's Strategy Typology 15
Organizations and Supply Chains 16
Value Chain 16
Supply chain 16
Supply Chain Management (SCM) 16
Supply Chain Integration 17
Innovation 17
Types of innovation 18
Business Process Management (BPM) 18
Models of Change Management 20
Lewin's Change Model 20
Leavitt's Diamond 22
User Satisfaction and Technology Acceptance 22
Technology acceptance model (TAM) 22
Technology diffusion 24
Technology infusion 24
Diffusion of Innovation Theory 25

[03] Business Information Systems **27**
Electronic Commerce (E-Commerce) 28
E-Commerce activities 28
B2B E-Commerce 28
B2C E-Commerce 28
C2C E-Commerce 29
C2B E-Commerce 30
Differences in E-Commerce 31
E-Government 31
Mobile Commerce (M-Commerce) 33
Social Commerce 33
Multistage Model for E-Commerce (B2B and B2C) 36
E-Commerce Challenges 37
Electronic and Mobile Commerce Applications 37
Marketing - Advertising 37
Market 37
Advertising 37
Bartering 38
Electronic payment 41
Enterprise Systems 41
Transaction processing systems (TPSs) 41
Batch processing system 42
Online transaction processing (OLTP) 42
Enterprise Resource Planning (ERP) 43
Advantages of ERP 44
ERP Vendors classes 44
Supply Chain Management (SCM) 44
Customer Relationship Management (CRM) 45
Key features of a CRM system include: 46
Product Lifecycle Management (PLM) 46
Challenges implementing Enterprise Systems 49

[04] Business Intelligence and Analytics **50**
Business Analytics 50
Business Intelligence (BI) 51
Business Intelligence and Analytics 51
Components 51
Tools 51
Spreadsheets 52

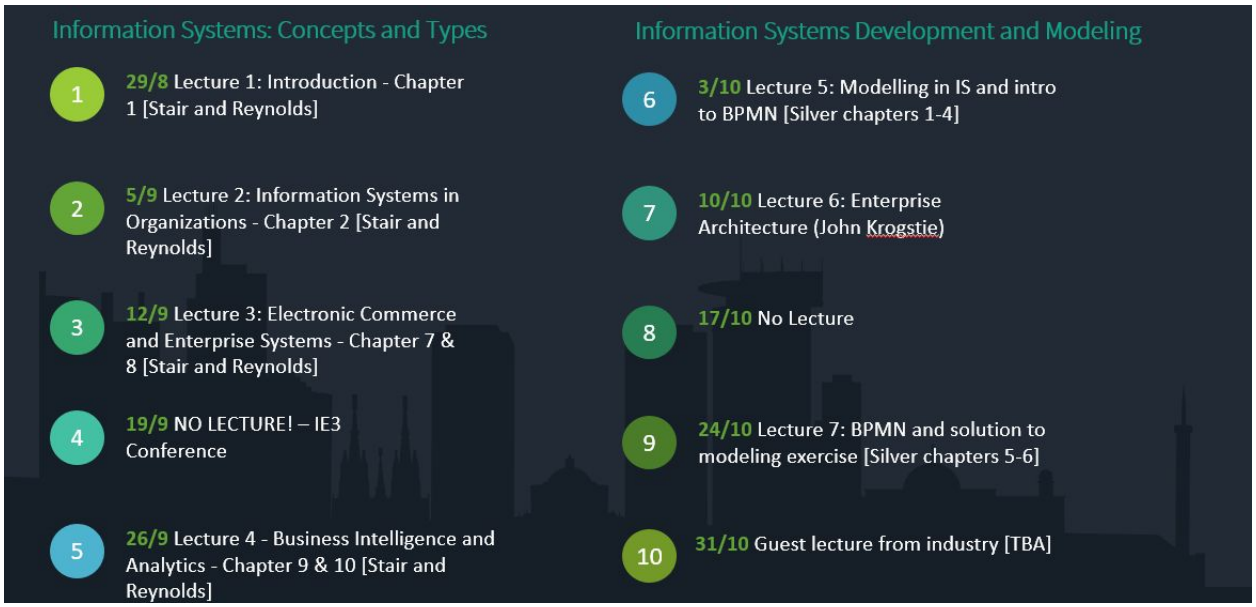
Data Visualization Tools 52
Online Analytical Processing (OLAP) 53
Drill-Down Analysis 53
Linear Regression 54
Data Mining 54
Dash Boards 56
Big Data 57
The 4V's of Big Data 58
Volume 58
Velocity 58
Veracity 59
Variety 59
Types of value creation from Big Data 61
Transparency 61
Decision Making 62
Marketing 62
Performance 63
Innovation 63
Knowledge Management 63
Knowledge 63
Knowledge Management System (KMS) 65
Technologies that support KM 65
Communities of Practice (COP) 66
Organizational Network Analysis 66
Web 2.0 Technologies 67
Artificial Intelligence (AI) 68
Expert Systems 68
Knowledge base 70
Inference Engine 70
Explanation facility 70
Robotics 70
Vision Systems 70
Natural Language Processing (NLP) 71
Learning Systems 71
Neural Networks (Bio) 72
Artificial Intelligence Systems 73
Intelligent behaviour 73
Brain Computer Interface (BCI) 74

[05] Modeling IS and BPMN **74**
Models 74
View: Abstraction 74
View: Projection 76
View: Decomposition 76
Transition System 77
Problems with transition systems 77
Business Processes and IS 77
BPMN 77
BPMN Level 1 - Descriptive Modelling 79
Elements 79
Modelling Palette (method and style) 80
Activities 81
Activity 81
Task 81
Subprocess 82
Pools 82
Lane 82
Flows 83
Message Flow 84
Gateways 84
Gateway 84
Exclusive Data-Based Gateway 86
Parallel Gateway 87
Events 88
Start event 89
End Event 89
Intermediate Event 90
Data & data Associations 91
Data Object 91
Data store 91

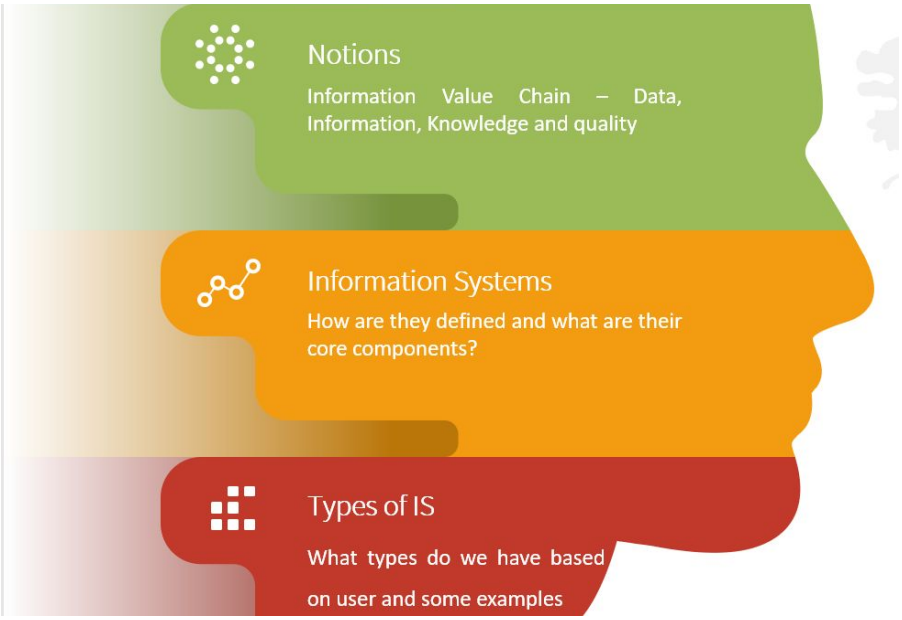
[06] Information Systems Methodology and Enterprise Architecture **98**
IS Methodology 98
Capabilities 99
Application portfolio Evolution 99
Enterprise Architecture 100
Stakeholder participation 100
Waterfall method 101

Alternatives to waterfall-model 102
Agile methods 102
Combining short and long term development 102
DevOps 104
Enterprise Architecture (EA) 104
Zachman's Framework 105
TOGAF 106

[07] Process Mining 110



[01] Introduction to Information Systems (IS)



Information Systems (IS) is an academic study of systems with a specific reference to information and the complementary networks of hardware and software that people and organizations use to collect, filter, process, create and also distribute data. An emphasis is placed on an information system having a definitive boundary, users, processors, storage, inputs, outputs and the aforementioned communication networks.

IS are interrelated <u>components</u> working together to ***collect, process, store, and disseminate information*** *to support* ***decision making, coordination, control, analysis, and visualization*** *in an organization.*

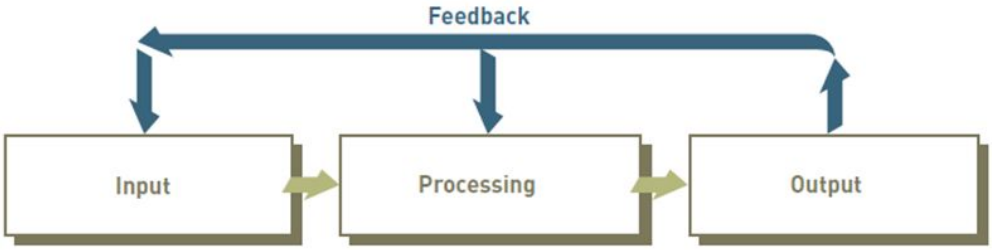


Figure 1.5

The Components of an Information System

Feedback is critical to the successful operation of a system.

A **socio-technical system (STS)** is one that considers requirements spanning hardware, software, personal, and community aspects. It applies an understanding of the social structures, roles and rights (the social sciences) to inform the design of systems that involve communities of people and technology.

A **Computer-Based Information Systems (CBIS)** is a single set of hardware, software, databases, networks, people, and procedures, that are configured to collect, manipulate, store, and process data into information.

FIGURE 1.2
Components of a computer-based information system
Hardware, software, networks, people, and procedures are part of a business's technology infrastructure.

Digitalization

1. Digitalization is not about technology, it is about how technological development change the way organizations operate and do business
2. Digitalization is not about transformation, it is about adaptation
3. Digitalization is about the ability of organizations, its leaders and employees, to adapt to rapid changes wrought by envolving digital technologies

Data, Information, and Knowledge

Data

Raw Facts

Information

Collection of data organized in such a way that they have value beyond the facts themselves.
Structured data

Process

Set of logically related tasks performed to achieve a defined outcome. Turning data into information is a *process*

Knowledge

Awareness and understanding of a set of information and the ways it can be made useful to support a task.
The process of defining relationships among data to create useful information requires knowledge.

Types of data

Data	Represented By
Alphanumeric data	Numbers, letters, and other characters
Audio data	Sounds, noises, or tones
Image data	Graphic images and pictures
Video data	Moving images or pictures

The Dimensions of Valuable Information

- Valuable information helps people perform tasks more efficiently and effectively
    - Inaccurate data can result in loss of potential new customers and reduced customer satisfaction

- If an organization's information is not accurate or complete:
    - People can make poor decisions, costing tremendous financial losses

- Depending on the type of data you need:
    - Some characteristics become more important than others

- Accuracy and completeness are critical for data used in accounting for the management of company assets

Deploying Information Systems

For each type of IS, certain key organizational complements must be in place:

- Well-trained workers
- System support and infrastructure
- Better teamwork
- Re-designed processes
- Deployment plan
- New decision rights and roles
- Links to organizational strategy

IS Types

1 **Personal IS**
Includes information systems that improve the productivity of individual users

2 **Group IS**
Includes information systems that improve communications and support collaboration among members of a workgroup

3 **Enterprise IS**
Includes information systems that organizations use to define structured interactions among their own employees and/or external customers, suppliers, government agencies, etc

TABLE 1.3 Examples and characteristics of each type of information system

	Personal IS	Group IS	Enterprise IS
Examples	Personal productivity software, decision-support system	Email, instant messaging, project management software	Transaction processing systems, enterprise systems, interorganizational systems
Benefits	Improved productivity	Increased collaboration	Increased standardization and ability to monitor work
Organizational complements (including well-trained workers, better teamwork, redesigned processes, and new decision rights)	• Does not bring complements with it • Partial benefits can be achieved without all complements being in place	• At least some complements must be in place when IS "goes live" • Allows users to implement and modify complements over time	• Full complements must be in place when IS "goes live"
Manager's role	• Ensure that employees understand and connect to the change • Encourage use • Challenge workers to find new uses	• Demonstrate how technology can be used • Set norms for participation	• Identify and put into place the full set of organizational complements prior to adoption • Intervene forcefully and continually to ensure adoption

Electronic and Mobile Commerce

E-commerce involves the exchange of money for goods and services over electronic networks.

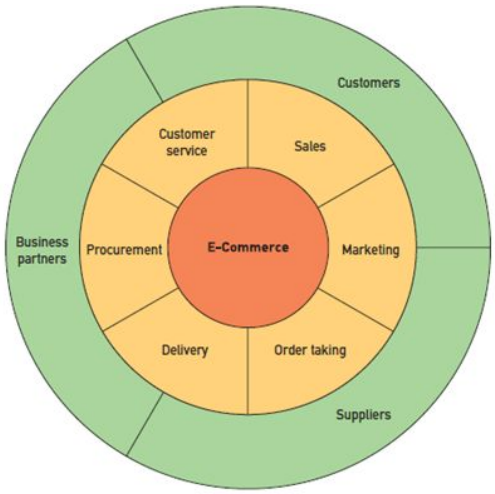


FIGURE 1.8
The scope of e-commerce
E-commerce covers a wide range o business activities.

Mobile commerce (m-commerce): the use of mobile, wireless devices to place and conduct business, e.g.: Instagram promoting products with links, store apps, online stores (web apps), etc..

Enterprise Systems

TABLE 1.7 Primary components of an ERP system for a manufacturing organization

Module	Business Functions Addressed
Supply chain management	Manages all activities involved in sourcing and procuring raw materials, converting raw materials to finished product, warehousing, and delivering finished product to customers
Customer relationship management	Automates and integrates the sales, marketing, and customer service functions to capture and store customer and prospect contact information, account data, and sales opportunities in one central location
Product lifecycle management	Manages product information throughout the entire life cycle of a product from ideation, design and manufacture, through service and remaining product disposal—across all departments, contractors, and suppliers
Maintenance, repair, and operations	Automates and supports activities involved with the planning and scheduling of maintenance and repairs for any sort of mechanical, plumbing, or electrical device, along with the tracking of inventory and ordering of necessary parts and supplies
Accounting	Tracks the flow of data related to all the cash flows that affect an organization; manages functions related to setting up and maintaining the general ledger, accounts payable, accounts receivable, and payroll
Human resource management	Supports activities related to previous, current, and potential employees of the organization; provides tools for workforce analysis and planning, hiring, training, job and task assignment, performance evaluation, salary administration, managing employee benefits, retirement, and outplacement

Business Intelligence and Analytics

Business intelligence (BI)

Includes a wide range of applications, practices, and technologies for the extraction, transformation, integration, visualization, analysis, interpretation, and presentation of data to support improved decision making.

Business analytics

The extensive use of data and quantitative analysis to support fact-based decision making within organizations.

Big data analytics

The use of high volume, variety, and velocity data for the generation of actionable insight.

System Acquisition and Development

TABLE 1.8 Alternatives for meeting users' information system needs

Strategy	Pros	Cons
Buy off-the-shelf software	+ A software solution can be acquired and deployed relatively quickly. + An organization can "test drive" software before acquiring it.	– Unmodified, the software may not be a good match to an organization's needs. – Maintenance and support costs can become excessive.
Build custom application	+ Customized software is more likely to be a good match to an organization's needs. + A custom application provides the potential to achieve competitive advantage.	– The cost to build a system can be quite high compared to the cost of purchasing of off-the-shelf software. – Customizing software can mean it will be months or even years before the software solution is ready to deploy.
Choose a software service provider	+ Users do not need to purchase and install additional hardware or software. + The service provider handles necessary hardware and software maintenance and upgrades.	– Complex pricing arrangements and hidden costs may reduce expected cost savings. – Performance issues may cause wide variations in performance over time.

[02] Information Systems in Organizations

Organization
A group of people that is structured and managed to meet its mission or set of group goals

- Structured: There are relationships between members of the organization and their various activities
- Processes: Defined by assigning roles, responsibilities, and authority to complete the various activities

Organizations are open systems
They affect and are affected by their surrounding environments

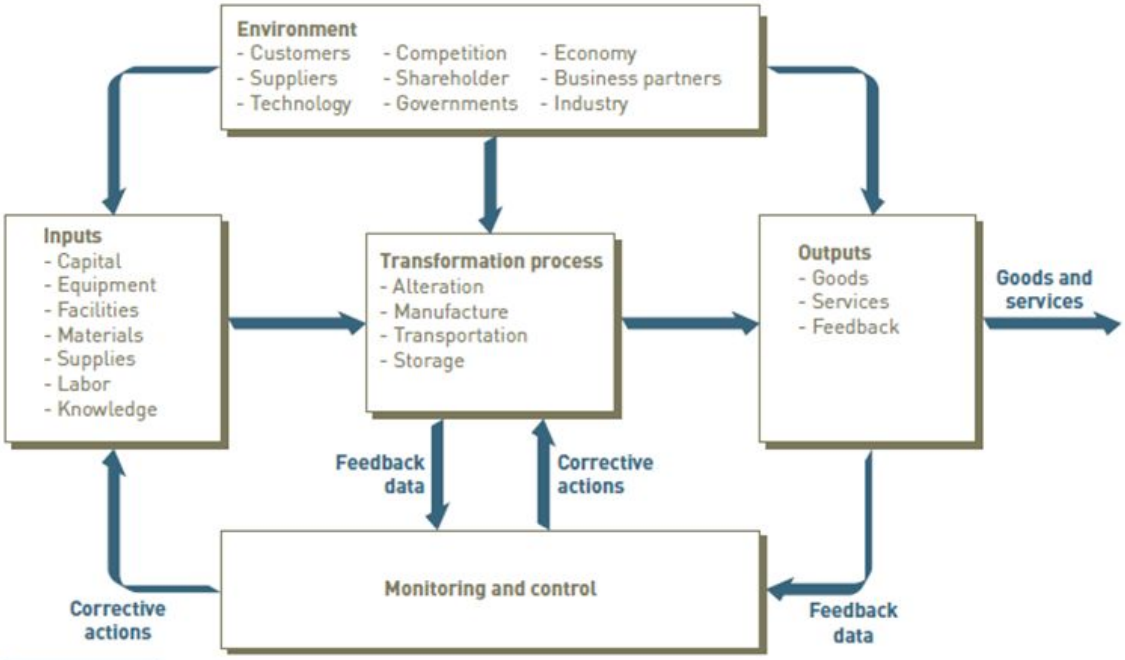


FIGURE 2.1

General model of an organization

Information systems support and work within the automated portions of an organizational process.

Miles and Snow's Strategy Typology

Strategy Type	Definition	Examples
Prospector	In innovative and growth oriented, searches for new markets and new growth opportunities, encourages risk taking	Amazon Google
Defender	Protects current markets, maintains stable growth, serves current customers	BIC Corporation YKK Group
Analyzer	Maintains current markets and current customer satisfaction with moderate emphasis on innovation	IBM Yahoo UBER
Reactor	No clear strategy, reacts to changes in the environments, drifts with events	NOKIA

Organizations and Supply Chains

Value Chain

A series (chain) of activities that an organization performs to transform inputs to outputs

- The value of the input is increased

Supply chain

The key-value chain in a manufacturing organization

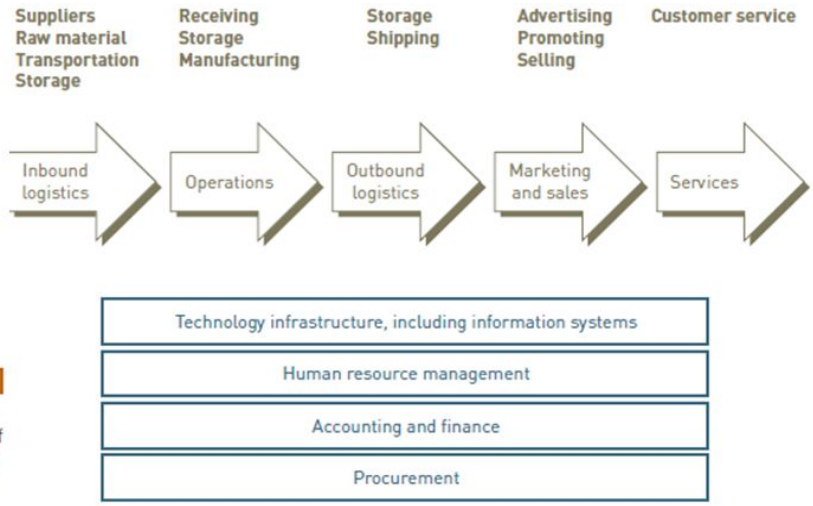


FIGURE 2.2
Supply chain
The primary and support activities of the manufacturing supply chain are concerned with creating or delivering a product or service.

Supply Chain Management (SCM)

Encompasess all the activities required to get the **right product** into the **right consumer's hands** in the **right quantity** at the **right time** and at the **right cost**

Supply Chain Integration

Innovation

Innovation
The application of new ideas to the products, processes, and activities of a firm, leading to increased value

- A catalyst for the growth and success of an organization

Can lead to cutting edge products:

- New customer segments and relations
- New revenue streams
- Increased profits
- --- > New business models

Types of innovation

- Sustaining (Incremental) innovation: results in enhancements to existing products, services, and ways of operating
  - ✓ Enable an organization to continually increase profits, lower costs, and gain market share

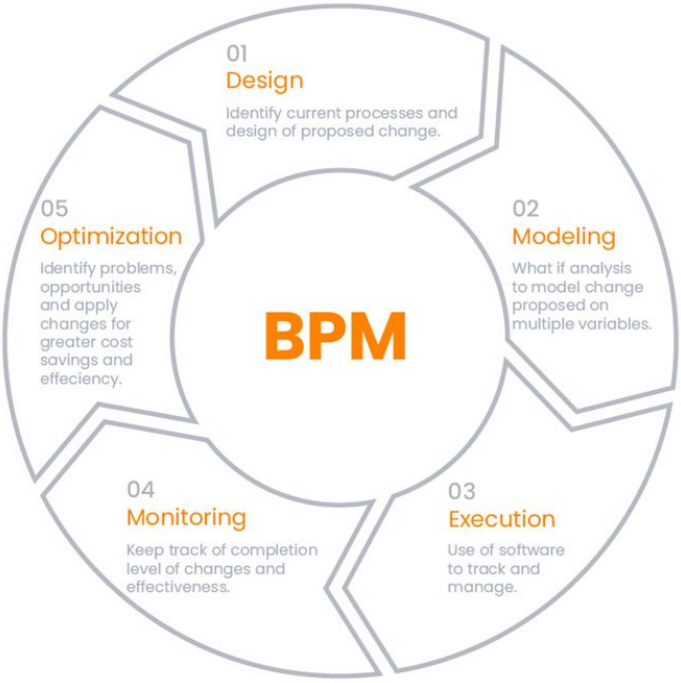
- Disruptive (Radical) innovation: one that initially provides a lower level of performance than the marketplace has grown to accept
  - ✓ Improved to provide new performance characteristics

NETFLIX

The *innovation* can be a *product*, *service* or *process*.

Business Process Management (BPM)

BPM is the art and science of overseeing how work is performed in an organization to ensure consistent outcomes and to take advantage of improvement opportunities.



Re-engineering
It involves the **radical** redesign of business processes, organizational structures, information systems, and values of the organization to achieve a breakthrough in business results

Continuous improvement
Constantly seeking ways to **improve** business processes and add value to products and services

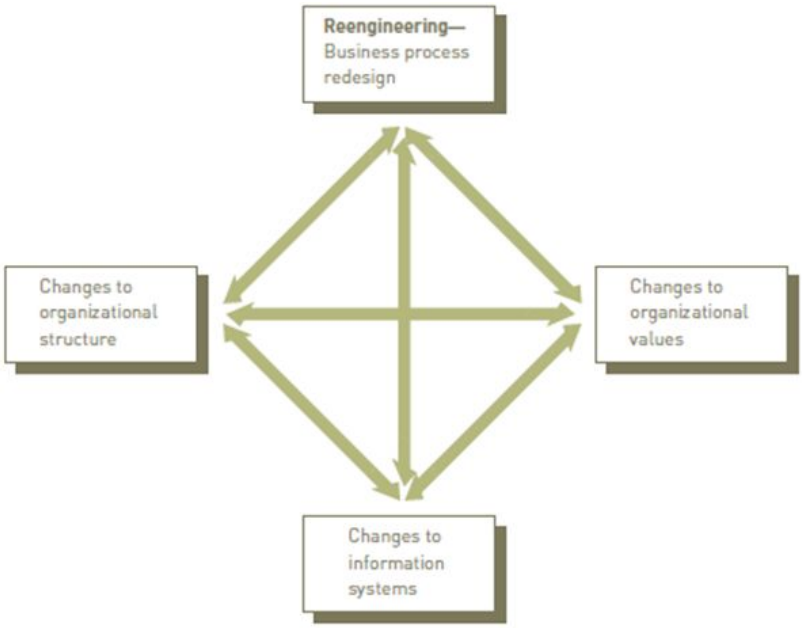


FIGURE 2.5
Reengineering
Reengineering involves the radical redesign of business processes, organizational structure, information systems, and the values of an organization to achieve a breakthrough in business results.

TABLE 2.1 Comparing business process reengineering with continuous improvement

Business Process Reengineering	Continuous Improvement
Strong action taken to solve serious problem	Routine action taken to make minor improvements
Top-down change driven by senior executives	Bottom-up change driven by workers
Broad in scope; cuts across departments	Narrow in scope; focuses on tasks in a given area
Goal is to achieve a major breakthrough	Goal is continuous, gradual improvements
Often led by resources from outside the company	Usually led by workers close to the business
Information systems are integral to the solution	Information systems provide data to guide the improvement team

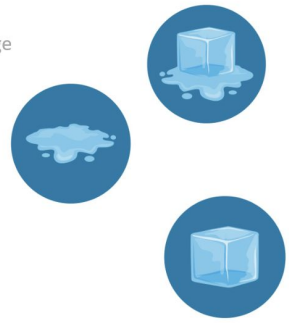
Models of Change Management

- Change management model
  - ✓ Describes the phases an individual or organization goes through in making a change
  - ✓ Provides principles for successful implementation of change
  - ✓ There are a number of models for dealing with the soft side of implementing change

Lewin's Change Model

- Lewin's change model consists of a three-stage approach for change

1. Unfreezing: preparing for change
2. Moving: making the change
3. Refreezing: institutionalizing



Unfreezing Preparing for change	Moving Making the change	Refreezing Institutionalizing
Key Tasks	**Key Tasks**	**Key Tasks**
Communicate what, why, when, who, how	Motivate individuals involved or affected	Monitor progress against success criteria
Draw on others, and seek input, ideas	Coach, train, lead, encourage, manage	Establish processes, systems to institutionalize change
Define objectives, success criteria, resources, schedule, budget	Provide appropriate resources	Establish controls to ensure change is occurring
Finalize work plans	Provide on-going feedback	Recognize and reward individuals for exhibiting new behavior
Assign leaders and implementation teams		Provide feedback, motivation, additional training to individuals not exhibiting new behavior

FIGURE 2.6
Lewin's change model
Change involves three stages: unfreezing (preparing for change), moving (making the change), and refreezing (institutionalizing the change).

Lewin's Force Field Analysis

- Lewin extended his change model theory to include force field analysis
  - ✓ Identifies both the driving (positive) and restraining (negative) forces that influence whether change can occur
- Driving forces: beliefs, expectations, and cultural norms that tend to encourage a change and give it momentum
- Restraining forces: those that make it difficult to accept a change or to work to implement a change

FIGURE 2.7
Lewin's force field analysis before addressing concerns
Many strong restraining forces will make it difficult to implement this change.

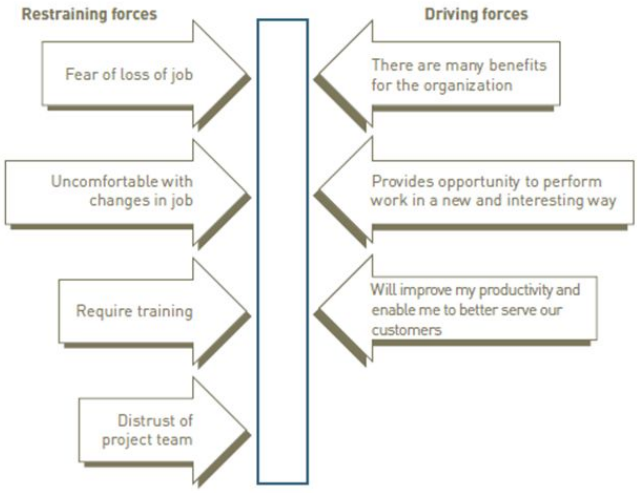


FIGURE 2.8
Lewin's force field analysis after addressing concerns
Restraining forces have been weakened and driving forces strengthened so there is a much likelihood of successfully implementing this change.

Leavitt's Diamond

- A theory that proposes that every organizational system is made up of four main components—people, tasks, structure, and technology—with an interaction among the four components
  - ✓ Any change in one of these elements will necessitate a change in the other three elements

- Organizational learning
  - ✓ The adaptations and adjustments based on experience and ideas over time
  - ✓ Adjustments can require re-engineering or can result from continuous improvement

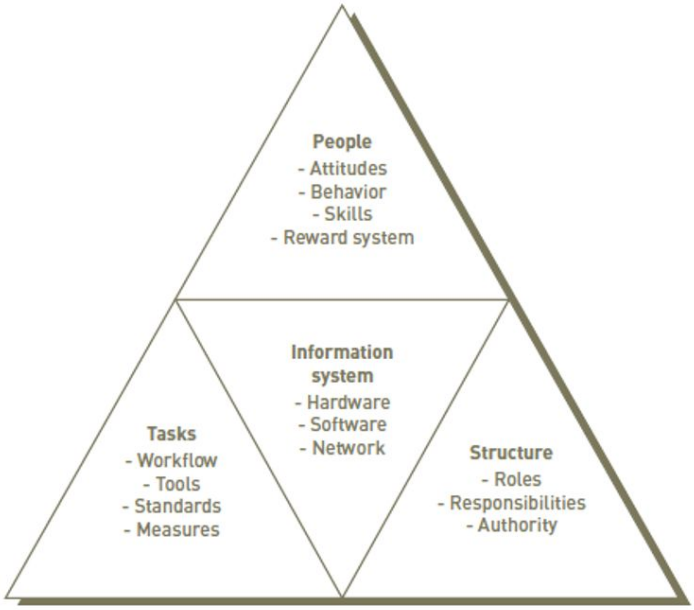


FIGURE 2.9
Leavitt's diamond
Any change in technology, people, task, or structure will necessitate a change in the other three components.

User Satisfaction and Technology Acceptance

Technology acceptance model (TAM)

Specifies the factors that can lead to better attitudes about the information system.
The models are good at explaining why people will use an Information System or new technology. They have been applied to different contexts, but they can only explain a maximum of about 70% of acceptance.

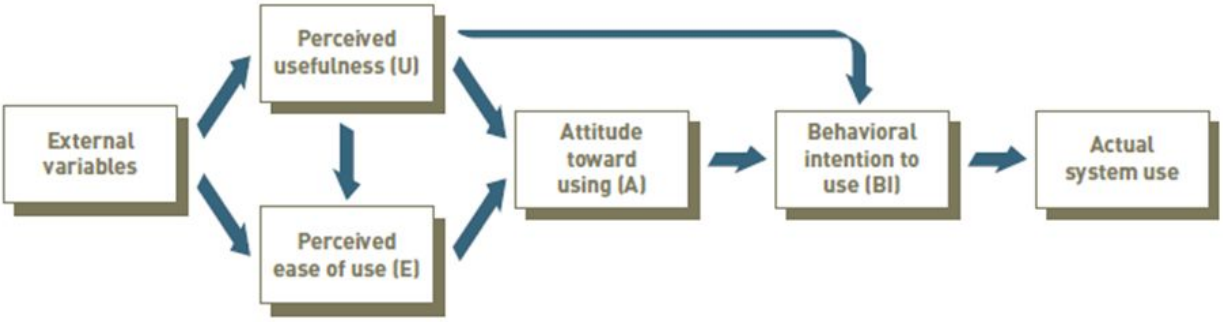


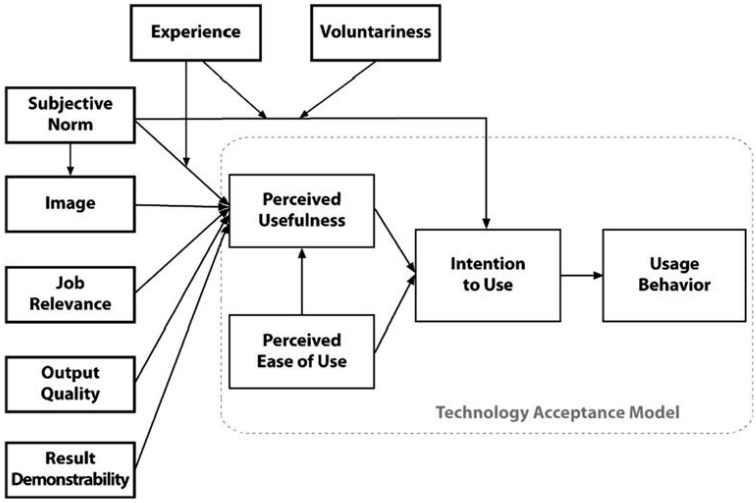
FIGURE 2.10

Technology acceptance model

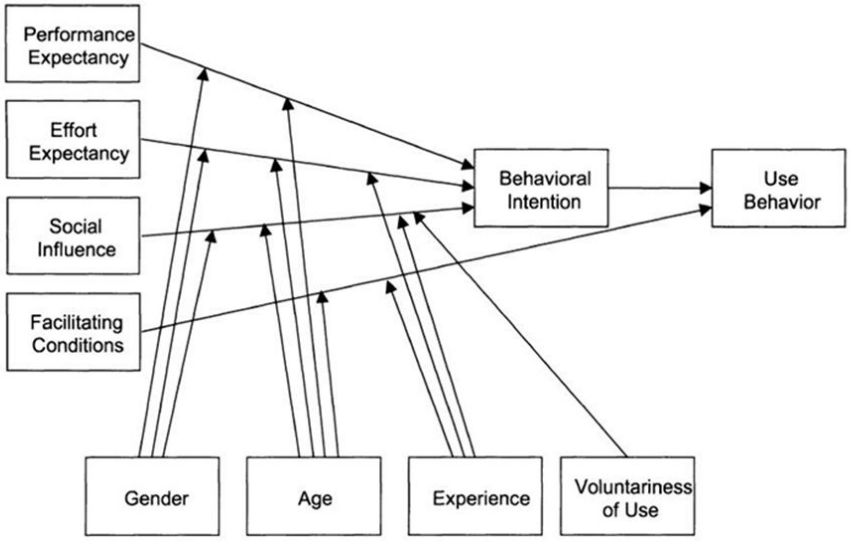
Perceived usefulness (U) and perceived ease of use (E) strongly influence whether someone will use an information system. Management can improve that perception by demonstrating that others have used the system effectively and by providing user training and support.

Technology Acceptance Model 2

- *subjective norm*: the influence of others on the user's decision to use or not to use the technology;
- *image*: the desire of the user to maintain a favorable standing among others;
- *job relevance*: the degree to which the technology was applicable;
- *output quality*: the extent to which the technology adequately performed the required tasks; and
- *result demonstrability*: the production of tangible results.



Unified Theory of Acceptance and Use of Technology (UTAUT)

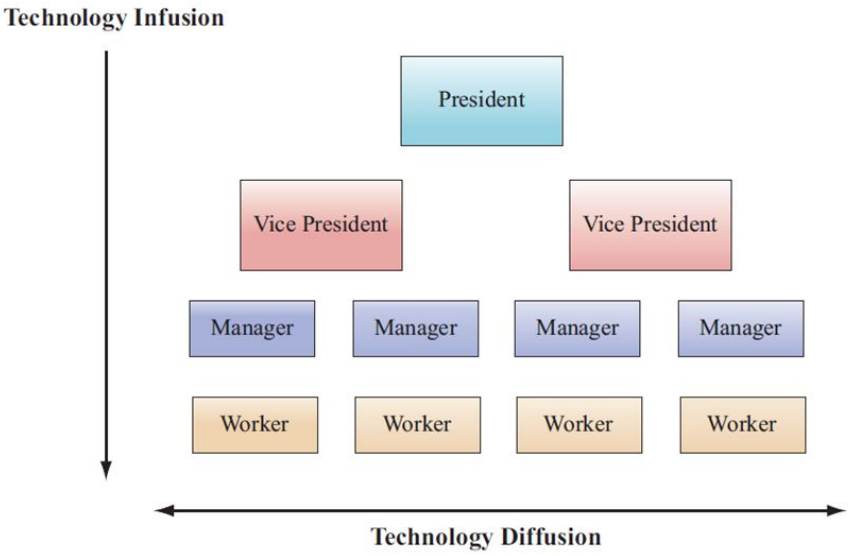


Technology diffusion

Measure of how widely technology is spread throughout an organization.

Technology infusion

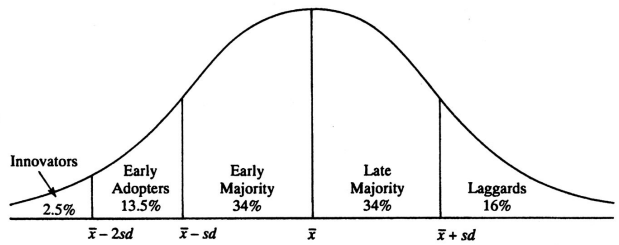
Extent to which technology permeates a department.



Diffusion of Innovation Theory

Explains how a new idea or product/service gains acceptance and diffuses/spreads through a specific population or subset of an organization

Figure 7-3. Adopter Categorization on the Basis of Innovativeness



The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption ($\bar{x}$).

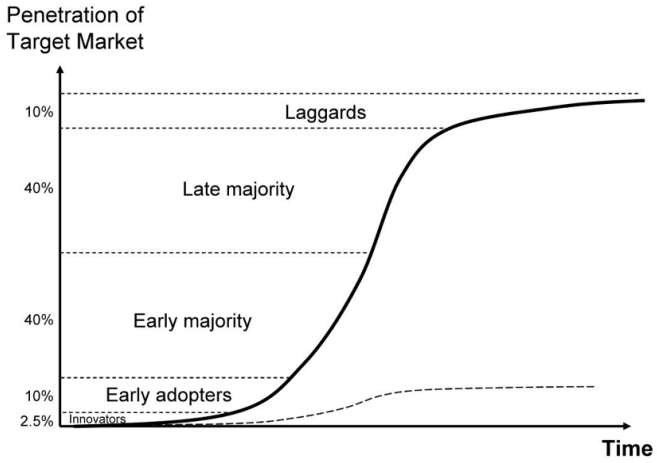
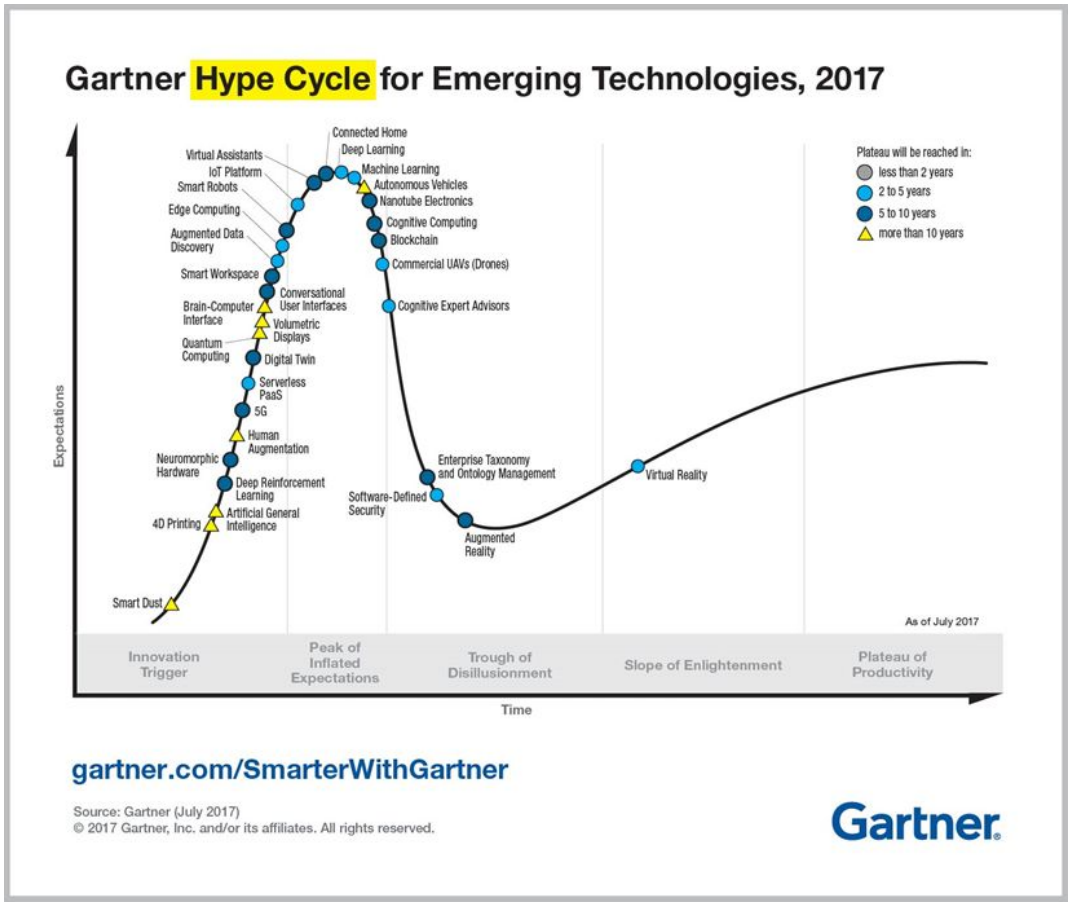


TABLE 2.2 Five categories of innovation adopters

Adopter Category	Characteristics	Strategy to Use
Innovator	Risk takers; always the first to try new products and ideas	Simply provide them with access to the new system and get out of their way
Early adopter	Opinion leaders whom others listen to and follow; aware of the need for change	Provide them assistance getting started
Early majority	Listen to and follow the opinion leaders	Provide them with evidence of the system's effectiveness and success stories
Late majority	Skeptical of change and new ideas	Provide them data on how many others have tried this and have used it successfully
Laggards	Very conservative and highly skeptical of change	Have their peers demonstrate how this change has helped them and bring pressure to bear from other adopters



1.A potential technology breakthrough kicks things off. Early proof-of-concept stories and media interest trigger significant publicity. Often no usable products exist and commercial viability is unproven.

2.Early publicity produces a number of success stories—often accompanied by scores of failures. Some companies take action; most don't.

3.Interest wanes as experiments and implementations fail to deliver. Producers of the technology shake out or fail. Investment continues only if the surviving providers improve their products to the satisfaction of early adopters.

4.More instances of how the technology can benefit the enterprise start to crystallize and become more widely understood. Second- and third-generation products appear from technology providers. More enterprises fund pilots; conservative companies remain cautious.

5.Mainstream adoption starts to take off. Criteria for assessing provider viability are more clearly defined. The technology's broad market applicability and relevance are clearly paying off. If the technology has more than a niche market then it will continue to grow.[5]

[03] Business Information Systems

Electronic Commerce (E-Commerce)

E-Commerce is conduction of business activities electronically over computer networks. Activities that are strong candidates for conversion to e-commerce are for example paper based, time-consuming and inconvenient for customers.

E-Commerce activities

Business to Customer (B2C)
When a person buys products or activities online.
E.g.: Amazon, BestBuy

Business to Business (B2B)
When E-Commerce websites orders from suppliers, or sellers deliver to customers.
E.g.: Telia buys iPhones from Apple

Consumer to Consumer (C2C)
When consumers directly trade with one another.
E.g.: Airbnb, Finn.no

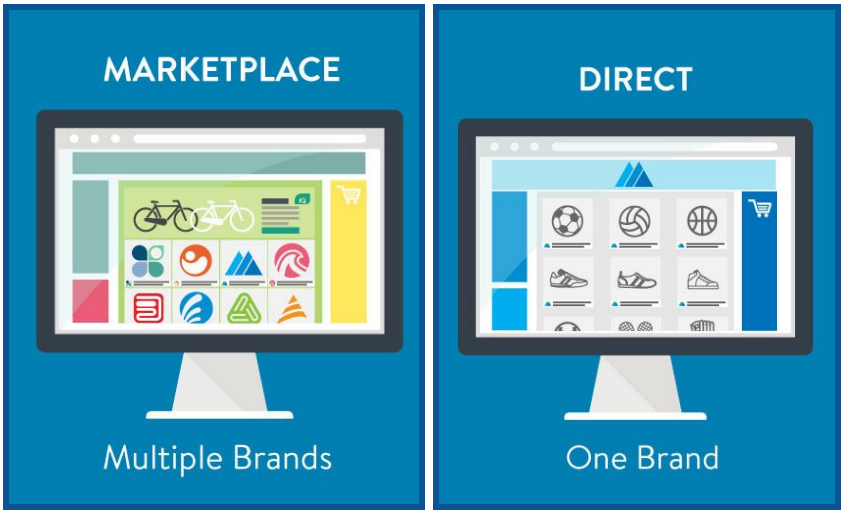
Government to Business or Consumer(G2B/G2C)
When a government transacts with business or consumer online.
E.g.: sending filled-out electronic forms (eg tax forms, social insurance forms)

B2B E-Commerce

B2B is a subset of e-commerce, where all the participants are organizations. It is a useful tool for connecting business partners in a virtual supply chain to cut resupply times and reduce costs.

Many organizations use both:

- Buy-side e-commerce to purchase goods and services from suppliers
- Sell-side e-commerce to sell products to their customers



B2C E-Commerce

B2C is a subset of e-commerce, where customers deal directly with an organization and avoid intermediaries; this is called disintermediation.

Reasons for steady growth:

- Cheaper goods and services via the web
- Online shoppers can design a personalized product
- The use of social media networks to promote products and reach customers

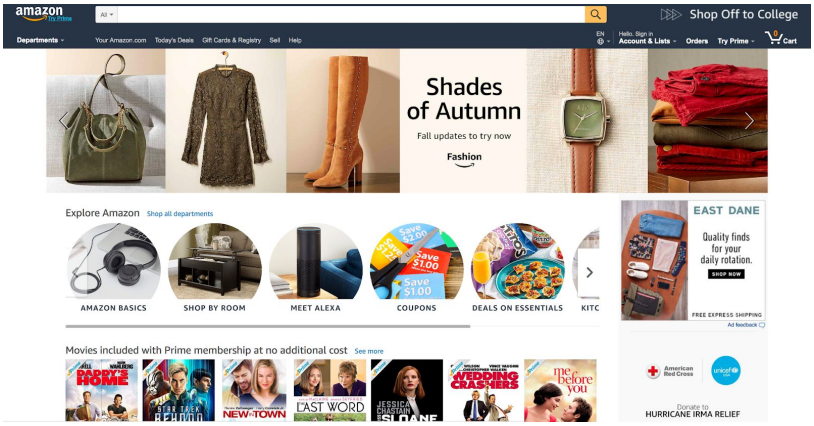
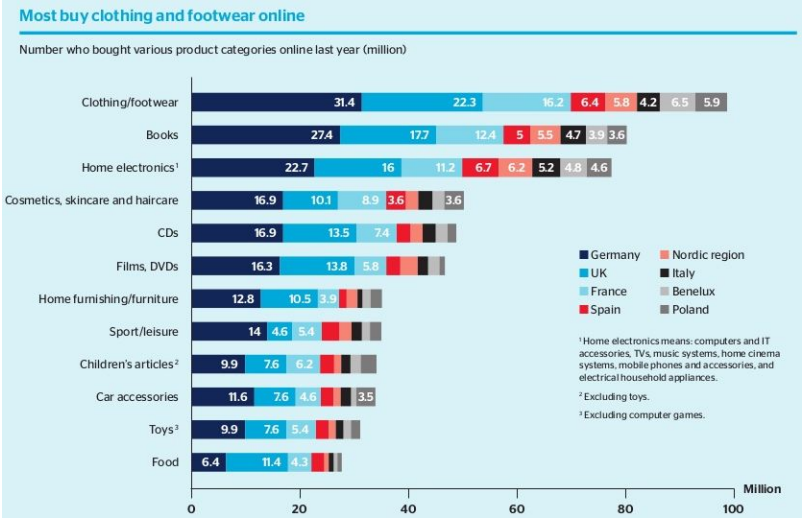


TABLE 7.1 Forecasted global B2C e-commerce sales (USD billions)

Region	Sales (billions) 2012	2013	2014	2015	2016	2017
Asia-Pacific	$301.2	$383.9	$525.2	$681.2	$855.7	$1,052.9
North America	$379.8	$431.0	$482.6	$538.3	$597.9	$660.4
Western Europe	$277.5	$312.0	$347.4	$382.7	$414.2	$445.0
Central and Eastern Europe	$41.5	$49.5	$58.0	$64.4	$68.9	$73.1
Latin America	$37.6	$48.1	$57.7	$64.9	$70.6	$74.6
Middle East and Africa	$20.6	$27.0	$33.8	$39.6	$45.5	$51.4
Worldwide	$1,058.2	$1,251.4	$1,504.6	$1,771.0	$2,052.7	$2,357.4

Source: "Global B2C Ecommerce Sales to Hit $1.5 Trillion This Year Driven by Growth in Emerging Markets," e-Marketer, February 3, 2014, *http://www.emarketer.com/Article/Global-B2C-Ecommerce-Sales-Hit-15-Trillion-This-Year-Driven-by-Growth-Emerging-Markets/1010575#sthash.2QGggr6U.dpuf.*



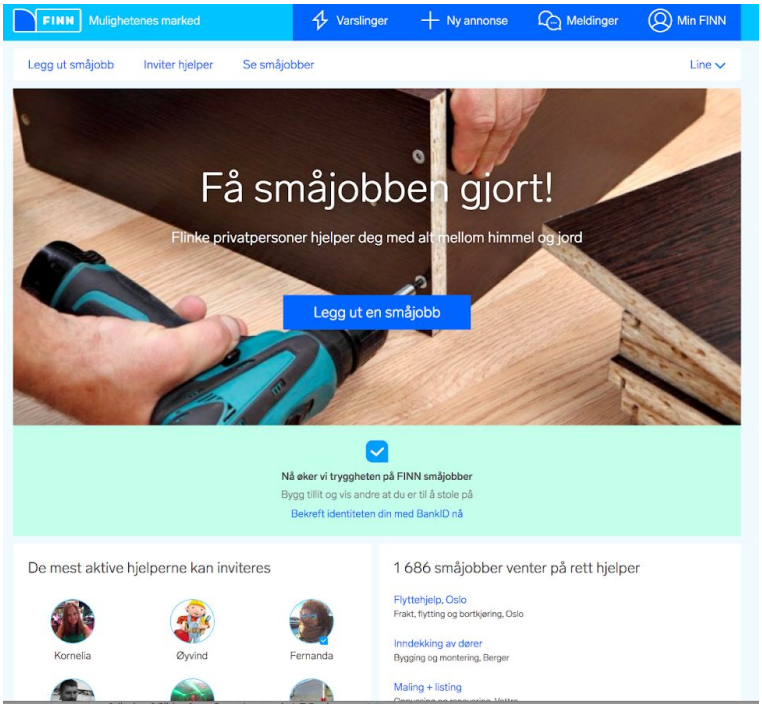
C2C E-Commerce

Involves electronic transactions between consumers that are facilitated by a third party. Popular sites are e.g.: eBay, Bidz, Craigslist, eBid, Fiverr, Ubid, etc..

Companies and individuals involved in C2C must be carefull, as sales must not violate the rules of various country, state, and country legal jurisdictions.

C2B E-Commerce

Involves the same type of transactions as B2C, just the other way around



Differences in E-Commerce

TABLE 7.3 Differences among B2B, B2C, and C2C

Factors	B2B	B2C	C2C
Typical value of sale	Thousands or millions of dollars	Tens or hundreds of dollars	Tens of dollars
Length of sales process	Days to months	Days to weeks	Hours to days
Number of decision makers involved	Several people to a dozen or more	One or two	One or two
Uniformity of offer	Typically a uniform product offering	More customized product offering	Single product offering, one of a kind
Complexity of buying process	Extremely complex; much room for negotiation on quantity, quality, options and features, price, payment, and delivery options	Relatively simple; limited negotiation on price, payment, and delivery options	Relatively simple; limited negotiation on payment and delivery options; negotiations focus on price
Motivation for sale	Driven by a business decision or need	Driven by an individual consumer's need or emotion	Driven by an individual consumer's need or emotion

E-Government

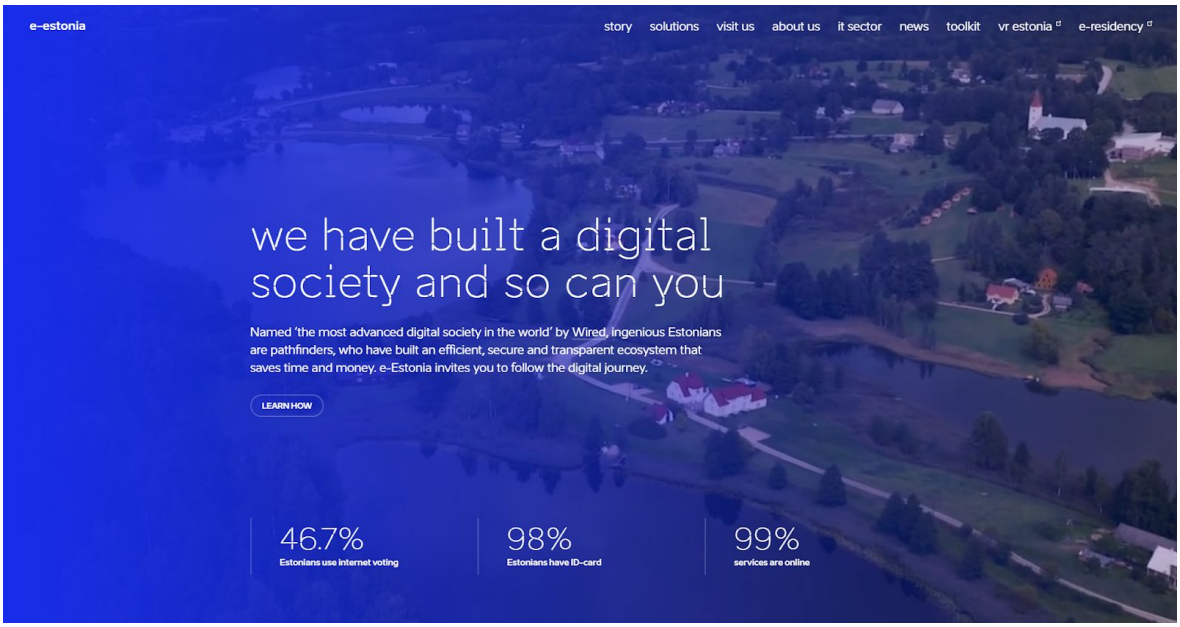
E-government is the use of information and communications technology to:

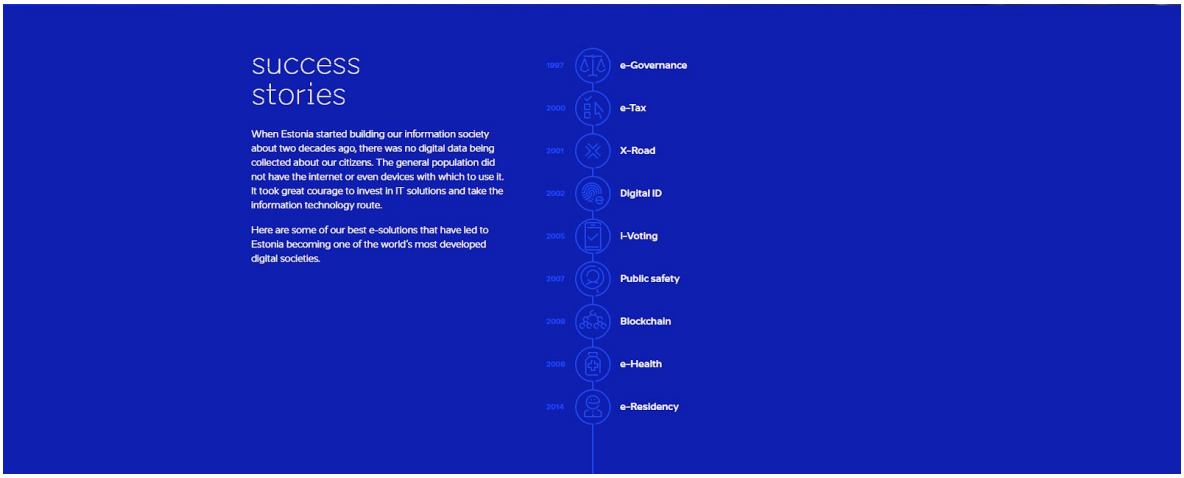
- Simplify the sharing of information
- Speed formerly paper-based processes
- Improve the relationship between citizens and government

Forms of e-Government:

- Government-to-Consumer (G2C)
- Government-to-Business (G2B)
- Government-to-Government (G2G)

E.g.: Estonia's e-estonia website illustrates greatly what E-Government is and how they are building towards an ambitious future for the government and their citizens.

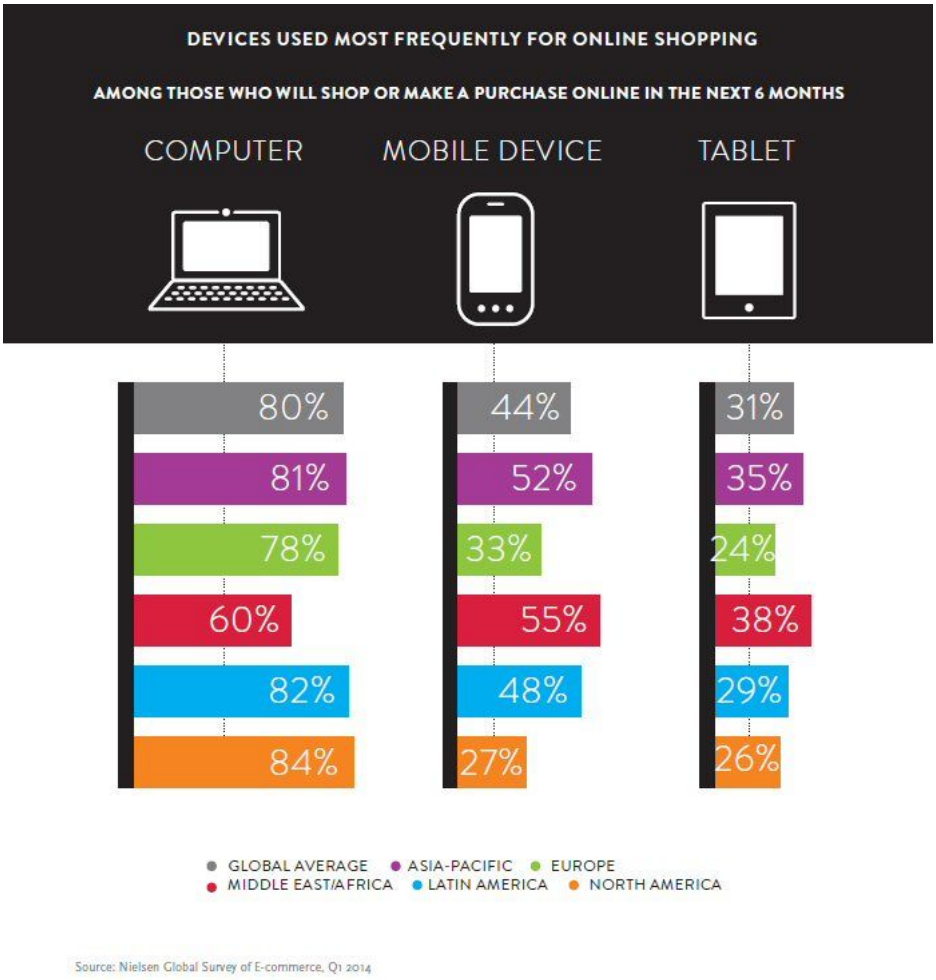




Mobile Commerce (M-Commerce)

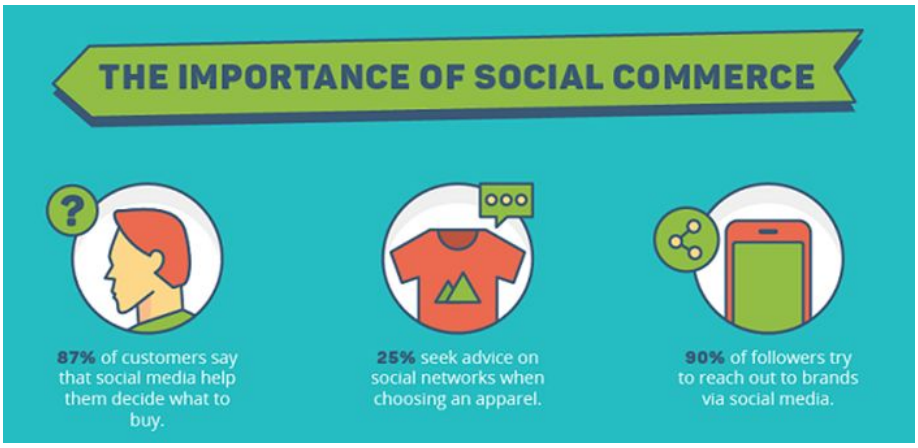
Mobile Commerce relies on the use of wireless devices.

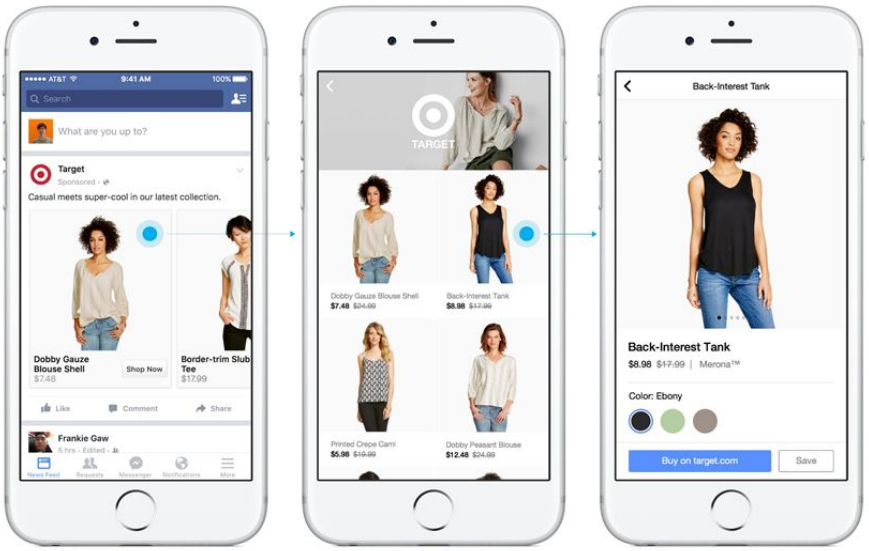
- The market for m-commerce in North America is maturing much later than in Western Europe and Japan
- The number of mobile Web sites worldwide is growing rapidly
- Worldwide, m-commerce accounted for 35% of all retail e-commerce sales in the fourth quarter of 2018

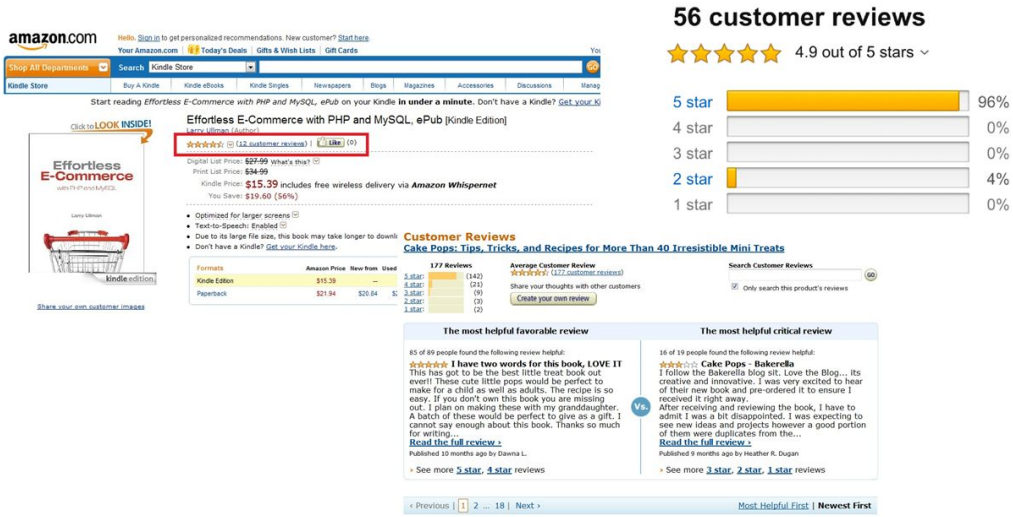


Social Commerce

A subset of e-commerce that involves social media, online media that supports social interaction, and user contributions to assist online buying and selling of products and services. It is user-generated content sharing of inline product information and advice.




AT&T
9:41 AM
100%
Search
What are you up to?
Target
Sponsored
Casual meets super-cool in our latest collection.
Dobby Gauze Blouse Shell
$7.48
Shop Now
Border-trim Slub Tee
$17.99
Like
Comment
Share
Frankie Gaw
TARGET
Dobby Gauze Blouse Shell
$7.48 $24.99
Back-Interest Tank
$8.98 $17.99
Printed Crepe Cami
$5.98 $19.99
Dobby Peasant Blouse
$12.48 $24.99
Back-Interest Tank
Back-Interest Tank
$8.98 $17.99 | Merona™
Color: Ebony
Buy on target.com
Save


amazon.com
Hello. Sign in to get personalized recommendations. New customer? Start here.
Your Amazon.com | Today's Deals | Gifts & Wish Lists | Gift Cards
Shop All Departments
Search Kindle Store
Kindle Store
Buy A Kindle | Kindle eBooks | Kindle Singles | Newspapers | Blogs | Magazines | Accessories | Discussions
Start reading Effortless E-Commerce with PHP and MySQL, ePub on your Kindle in under a minute. Don't have a Kindle? Get your Ki
Click to LOOK INSIDE!
Effortless E-Commerce
Effortless E-Commerce with PHP and MySQL, ePub [Kindle Edition]
Larry Ullman (Author)
(12 customer reviews) | Like (0)
Digital List Price: $27.99 What's this?
Print List Price: $34.99
Kindle Price: $15.39 includes free wireless delivery via Amazon Whispernet
You Save: $19.60 (56%)
Optimized for larger screens
Text-to-Speech: Enabled
Due to its large file size, this book may take longer to downl
Don't have a Kindle? Get your Kindle here.
Formats | Amazon Price | New from | Used
Kindle Edition | $15.39 | --
Paperback | $21.94 | $20.84
Share your own customer images
Customer Reviews
Cake Pops: Tips, Tricks, and Recipes for More Than 40 Irresistible Mini Treats
177 Reviews
5 star: (142)
4 star: (21)
3 star: (9)
2 star: (3)
1 star: (2)
Average Customer Review
(177 customer reviews)
Share your thoughts with other customers
Create your own review
Search Customer Reviews
Only search this product's reviews
The most helpful favorable review
85 of 89 people found the following review helpful:
I have two words for this book, LOVE IT
This has got to be the best little treat book out ever!! These cute little pops would be perfect to make for a child as well as adults. The recipe is so easy. If you don't own this book you are missing out. I plan on making these with my granddaughter. A batch of these would be perfect to give as a gift. I cannot say enough about this book. Thanks so much for writing...
Read the full review ›
Published 10 months ago by Dawna L.
› See more 5 star, 4 star reviews
vs.
The most helpful critical review
16 of 19 people found the following review helpful:
Cake Pops - Bakerella
I follow the Bakerella blog sit. Love the Blog... its creative and innovative. I was very excited to hear of their new book and pre-ordered it to ensure I received it right away.
After receiving and reviewing the book, I have to admit I was a bit disappointed. I was expecting to see new ideas and projects however a good portion of them were duplicates from the...
Read the full review ›
Published 9 months ago by Heather R. Dugan
› See more 3 star, 2 star, 1 star reviews
‹ Previous | 1 2 .. 18 | Next ›
Most Helpful First | Newest First

56 customer reviews
4.9 out of 5 stars
5 star 96%
4 star 0%
3 star 0%
2 star 4%
1 star 0%

Multistage Model for E-Commerce (B2B and B2C)

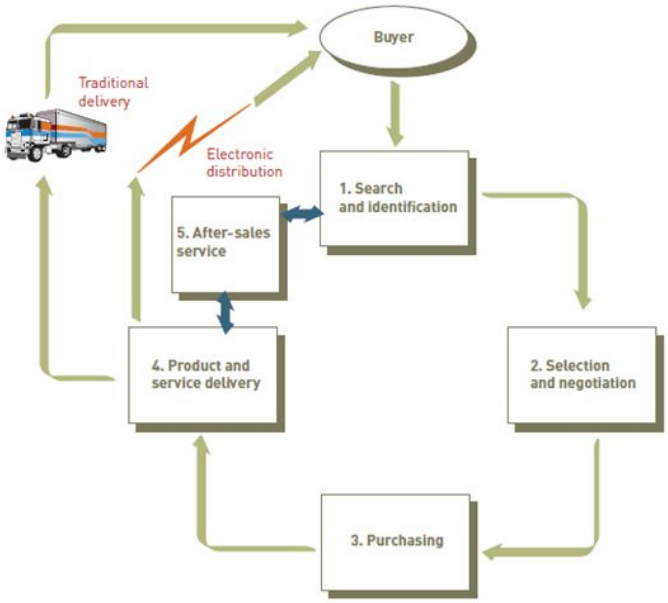
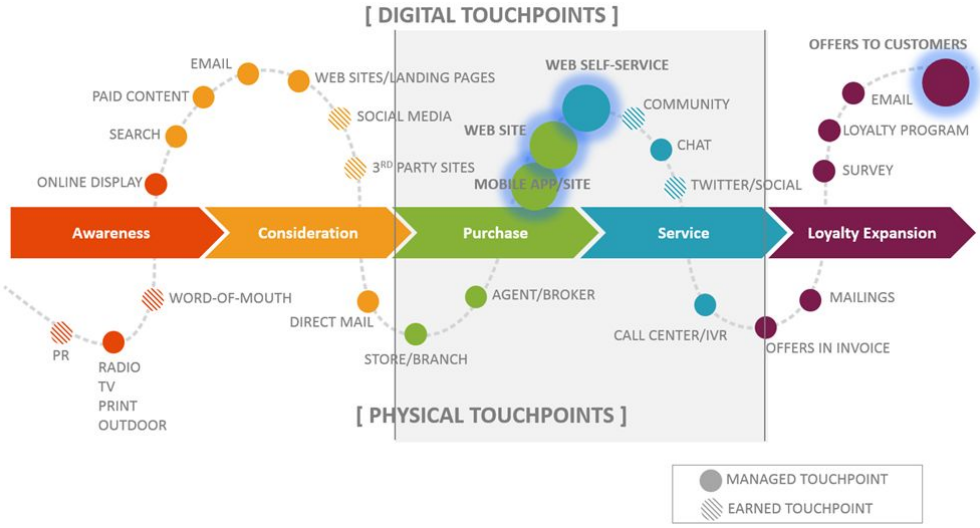


FIGURE 7.2
Multistage model for e-commerce (B2B and B2C)
A successful e-commerce system addresses the stages that consumers experience in the sales life cycle.

FIGURE 7.3
Product and information flow
When a customer orders an HP printer online, the order goes first to FedEx, which ships the order, triggering an email notification to the customer and an inventory notice to HP.



E-Commerce Challenges

- Dealing with Consumer Privacy Concerns
    - About one-third of all adult Internet users will not buy online due to privacy concerns.

- Overcoming Consumers' Lack of Trust
    - In online sellers

- Overcoming Global Issues
    - Cultural, language, time and distance, infrastructure, currency, and legal challenges

Electronic and Mobile Commerce Applications

Areas in which applications are used:

- Retail and wholesale – Manufacturing
- Marketing – Advertising
- Bartering – Retargeting
- Price comparison – Couponing
- Investment and finance – Banking

Marketing - Advertising

Market

Market segmentation is the identification of specific markets to target customers with advertising messages

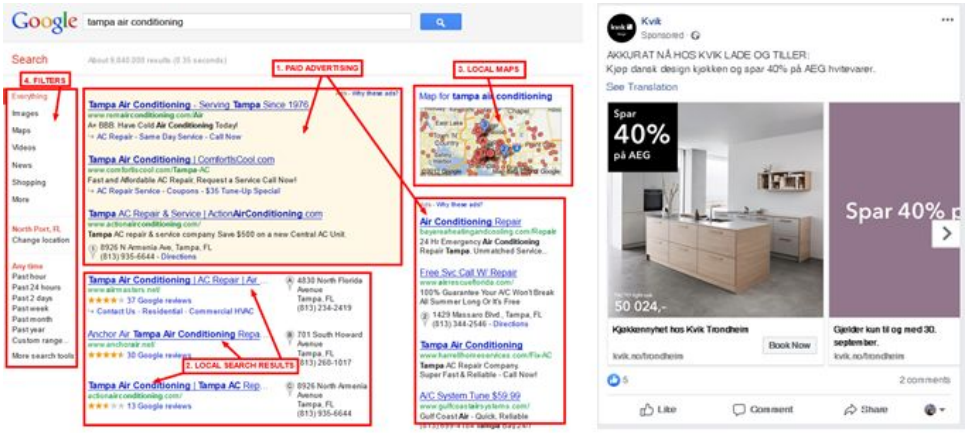
- Divides the pool of potential customers into subgroups usually defined in terms of <u>demographic characteristics</u>
- Personalized based on <u>search history</u> and <u>interests</u>

Advertising

- Cost per thousand (CPM), also called Cost Per Mile - hence CPM
- Cost Per Click (CPC)
- Cost Per Action (CPA)

Three main measures of success:

- Number of users reached
- Click through rate (CTR)
- Number of actions users take



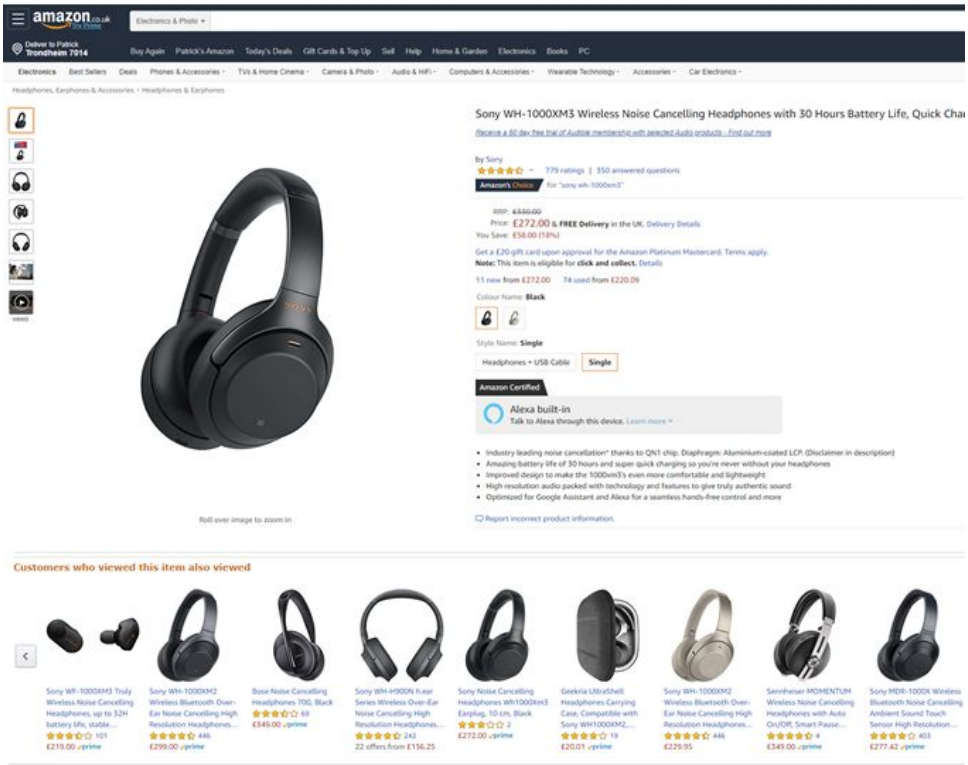
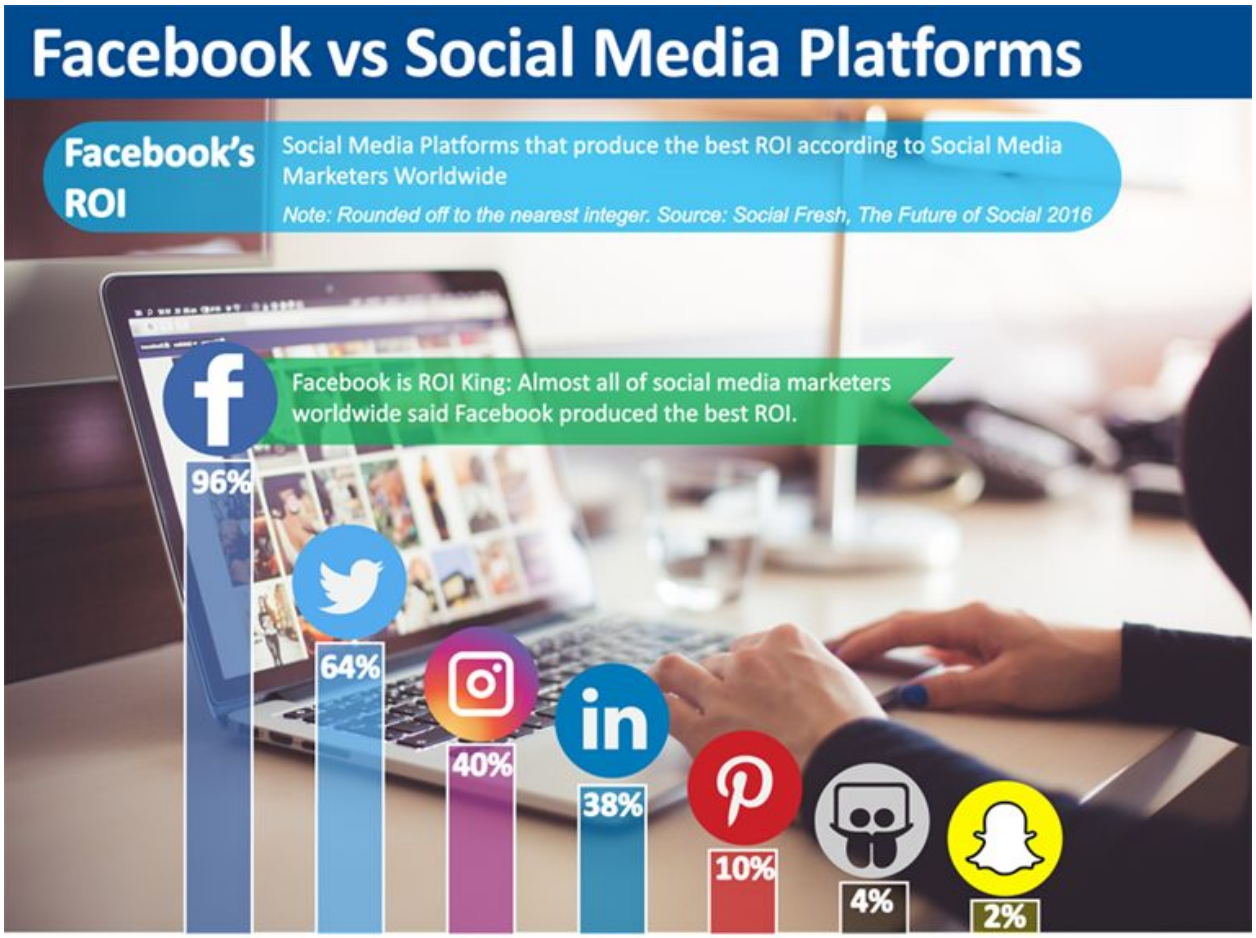


TABLE 7.5 Characteristics of three types of mobile advertising networks

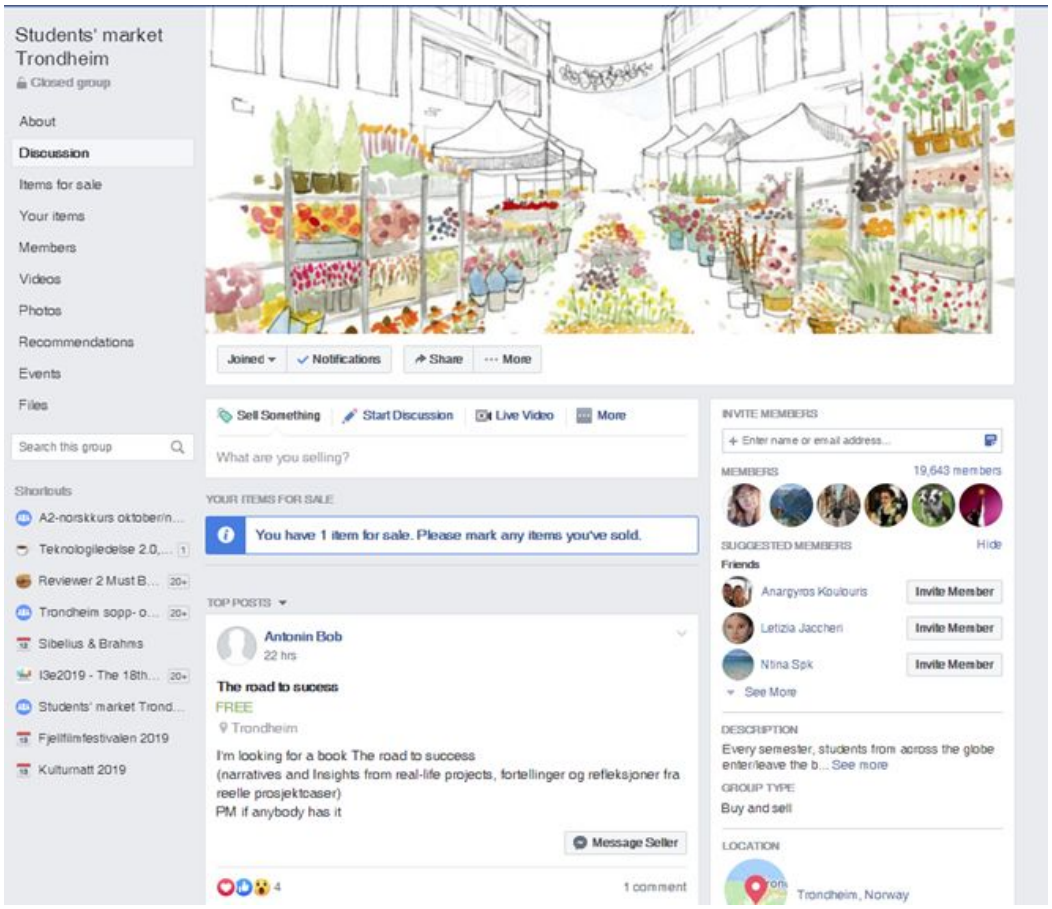
Characteristic	Blind Networks	Premium Blind Networks	Premium Networks
Degree to which advertisers can specify where ads are run	An advertiser can specify country and content channel (e.g., news, sports, or entertainment) on which the ad will run but not a specific Web site.	Most advertising is blind, but for an additional charge, the advertiser can buy a specific spot on a Web site of its choice.	Big brand advertisers can secure elite locations on top-tier destinations.
Predominant pricing model and typical rate	CPC (e.g., $0.01 per click)	CPM (e.g., $20 per thousand impressions)	CPM (e.g., $40 per thousand impressions)
Examples	Admoda/Adultmoda AdMob BuzzCity InMobi	Jumptap Madhouse Millennial Media Quattro Wireless	Advertising.com/AOL Hands Microsoft Mobile Advertising Nokia Interactive Advertising Pudding Media YOC Group



Bartering

TABLE 7.6 Popular bartering Web sites

Web site	Purpose
Craiglist.org	Includes a section where users can request an item in exchange for services or exchange services for services
Swapagift.com	Enables users to buy, sell, or swap merchant gift cards
Swapstyle.com	Allows users to swap, sell, or buy direct women's accessories, clothes, cosmetics, and shoes
Swaptrees.com	Users trade books, CDs, DVDs, and video games on a one-for-one basis
TradeAway.com	Enables users to exchange a wide variety of new or used items, services, or real estate



Electronic payment

Klarna.

Enterprise Systems

Transaction processing systems (TPSs)

- Capture and process detailed data necessary to update the organization's records about fundamental business operations

- Include order entry, inventory control, payroll, accounts payable, accounts receivable, general ledger, etc.

A TPS provides valuable input to:
- Management information systems
- Decision support systems
- Knowledge management systems

A TPS includes:
Order processing systems
- Processing flow begins with receipt of customer order, then finished product inventory is checked to see if sufficient inventory is on hand to fill the order.
- Product pick list is printed at the warehouse and inventory is adjusted
- Customer invoice is created and copy included in the customer shipment.

Accounting systems

- Must track the flow of data related to all the cash follows that affect the organization

Purchasing systems

- Systems that support the purchasing business function
- Inventory control, purchase order processing, receiving, and accounts payable

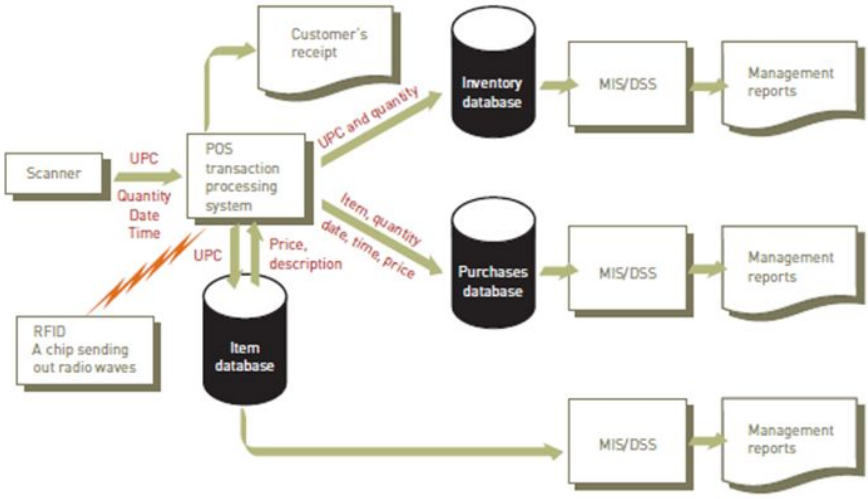


FIGURE 8.6
Point-of-sale transaction processing system
The purchase of items at the check-out stand updates a store's inventory database and its database of purchases.

Batch processing system

- Business transactions are accumulated over a period of time and prepared for processing as a single unit or batch
- Essential characteristic: the delay between an event and the processing of the related transaction to update the organization's records
- E.g.: DnB bank transfer

Online transaction processing (OLTP)

- Data processing in which each transaction is processed immediately
- At any time, the data in an online system reflects the current status
- Many organizations find that OLTP enables them to provide faster, more efficient service
- E.g.: Vipps

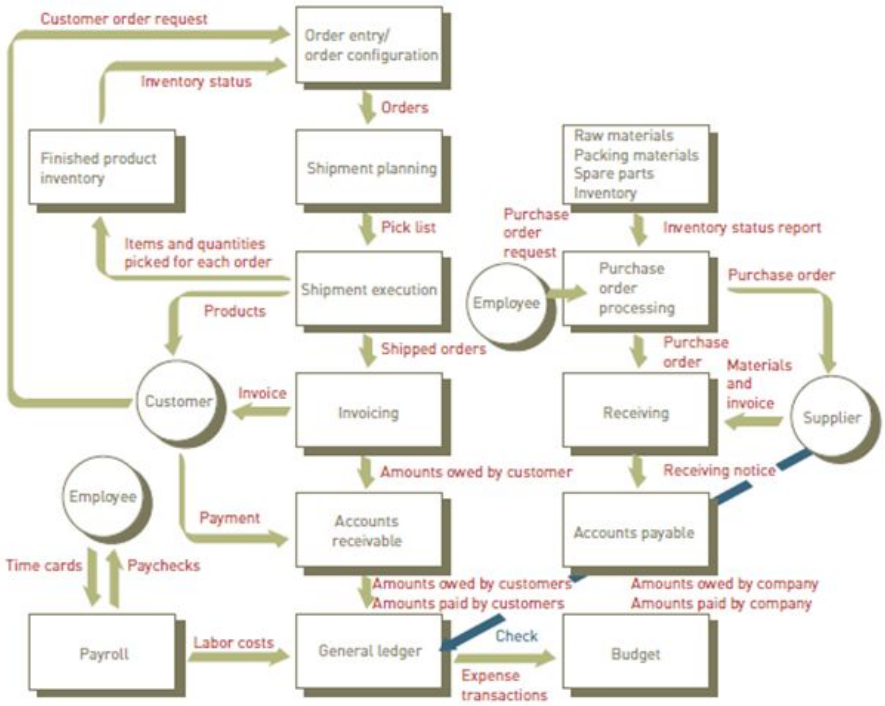


FIGURE 8.4

Integration of a firm's TPS

When transactions entered into one system are processed, they create new transactions that flow into another system.

Enterprise Resource Planning (ERP)

A set of integrated programs that manage a company's vital business operations for an entire organization.

Think about all the core processes needed to run a company: finance, HR, manufacturing, supply chain, services, procurement, and others. At its most basic level, ERP integrates these processes into a single system. But new ERP systems are anything but basic. They use the latest technologies – such as machine learning and AI – to provide intelligence, visibility, and efficiency across every aspect of a business.

Business process
A set of coordinated and related activities that takes on one or more kinds of input and creates and output of value to the customer of that process.

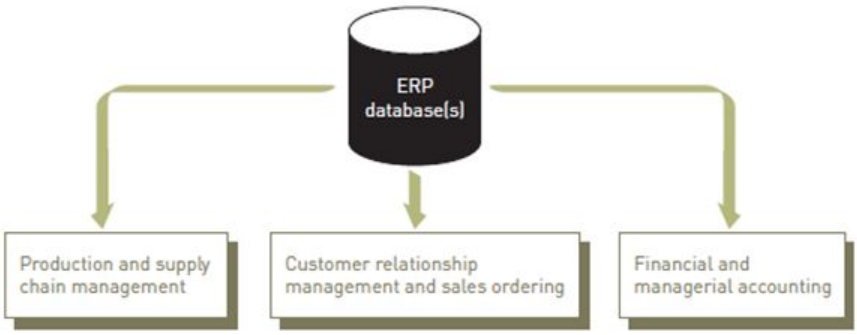


FIGURE 8.7
Enterprise resource planning system
An ERP integrates business processes and the ERP database.

Advantages of ERP

- Improved access to quality data for operational decision making
- Elimination of costly, inflexible legacy systems
- Improvement of work processes
- Opportunity to upgrade and standardize technology infrastructure

ERP Vendors classes

- Tier I vendors – target large multinational firms with multiple geographic locations and annual revenues in excess of $1 billion
- Tier II vendors – target medium-sized firms with annual revenues in the $50 million to $1 billion range operating out of one or more locations
- Tier III vendors – target smaller firms with annual revenues in the $10 million to $50 million range that typically operate out of a single location

Supply Chain Management (SCM)

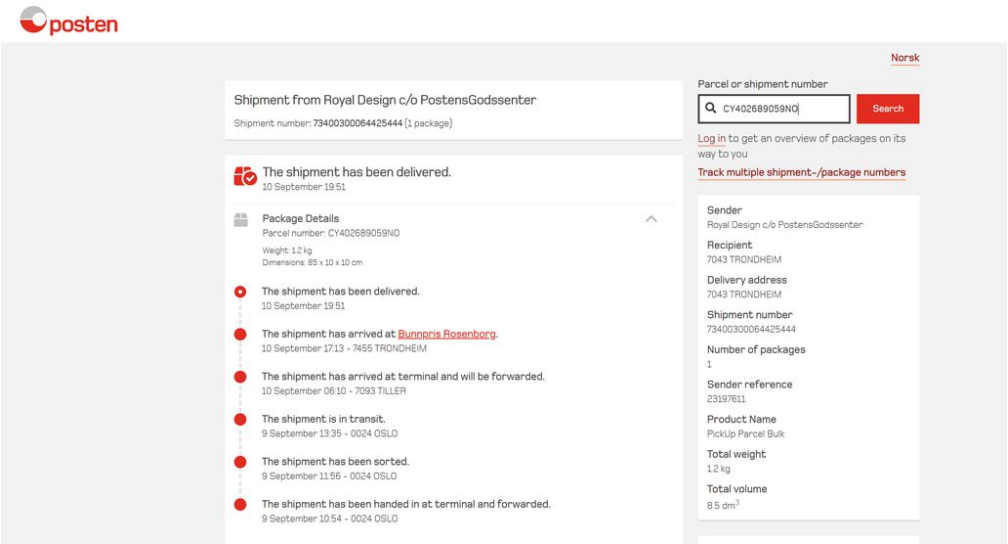
Supply chain management (SCM) is a system that includes planning, executing, and controlling all activities involved in:

- Sourcing and procurement of raw materials

- Converting raw materials to finished products
- Warehousing and delivering finished product to customers

SCM manages materials, information, and finances as they move from:

- Supplier -> Manufacturer -> Wholesaler -> Retailer -> Consumer



Customer Relationship Management (CRM)

Customer relationship management (CRM) system helps a company manage all aspects of customer encounters, including marketing, sales, distribution, accounting, and customer service. The goal of CRM is to understand and anticipate the needs of current and potential customers

CRM is used primarily in sales, marketing, and service organizations:

- To capture and view data about customers and to improve communications

CRM software: Automates and integrates the functions of sales, marketing, and service in an organization.

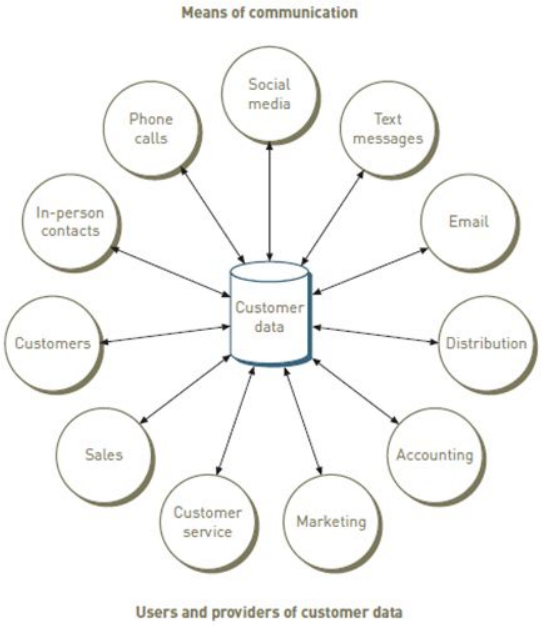


FIGURE 8.10
Customer relationship management system
A CRM system provides a central repository of customer data used by the organization.

Key features of a CRM system include:

- Contact management
- Sales management
- Customer support
- Marketing automation
- Analysis
- Social networking
- Access by smartphones
- Import contact data

Product Lifecycle Management (PLM)

An enterprise business strategy that creates a common repository of product information and processes. Supports the collaborative creation, management, dissemination, and the use of product and packaging definition information.

Product lifecycle management (PLM) software:

- Provides a means for managing the data and processes associated with the various phases of the lifecycle of a product
- The scope of PLM software may include computer-aided design, computer-aided engineering, and computer-aided manufacturing
-

FIGURE 8.12
Scope of PLM software
Using PLM software, organizations can manage the data and processes associated with the various phases of the product life cycle.

Computer-aided design (CAD):

- The use of software to assist in the creation, analysis, and modification of the design of a component or product

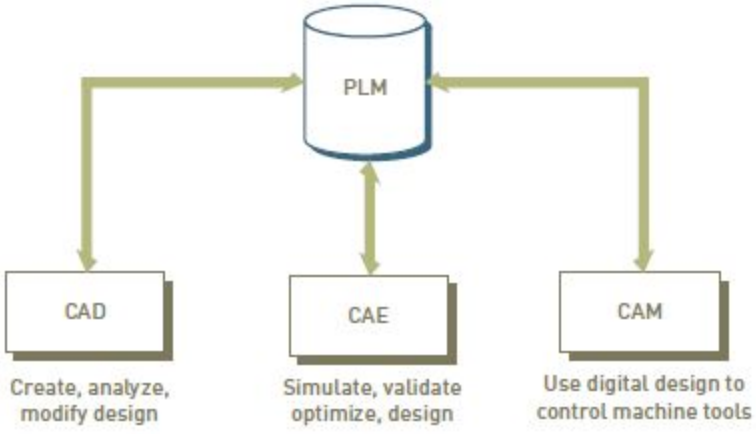
Computer-aided engineering (CAE):

- The use of software to analyze the robustness and performance of components and assemblies

Computer-aided manufacturing (CAM)

- The use of software to control machine tools and related machinery in the manufacture of components and products

FIGURE 8.13
CAD, CAE, and CAM software
In manufacturing, the model generated in CAD and verified in CAE can be entered into CAM software, which then controls the machine tool.



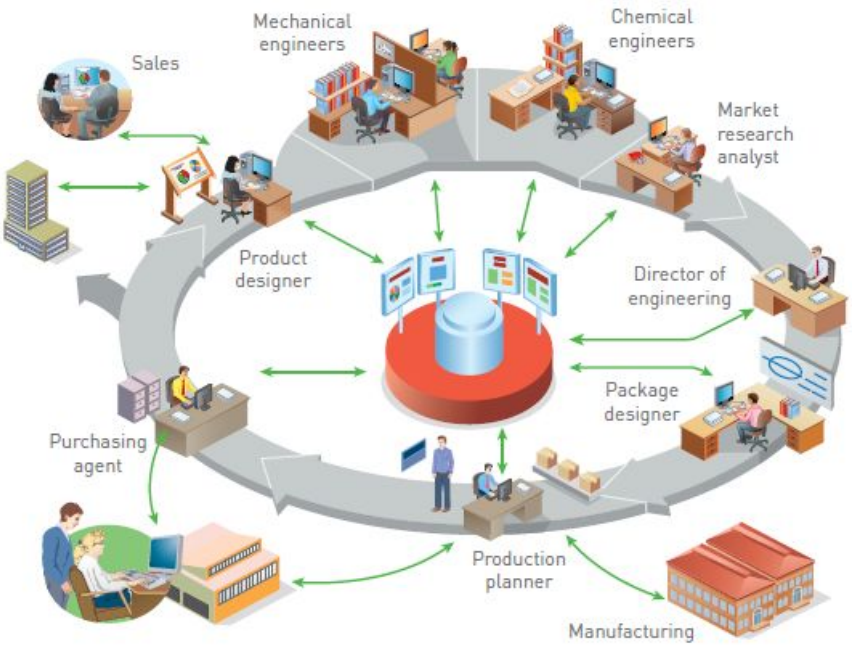


FIGURE 8.14
PLM business strategy
PLM powers innovation and improves productivity.

TABLE 8.5 Benefits of a PLM system

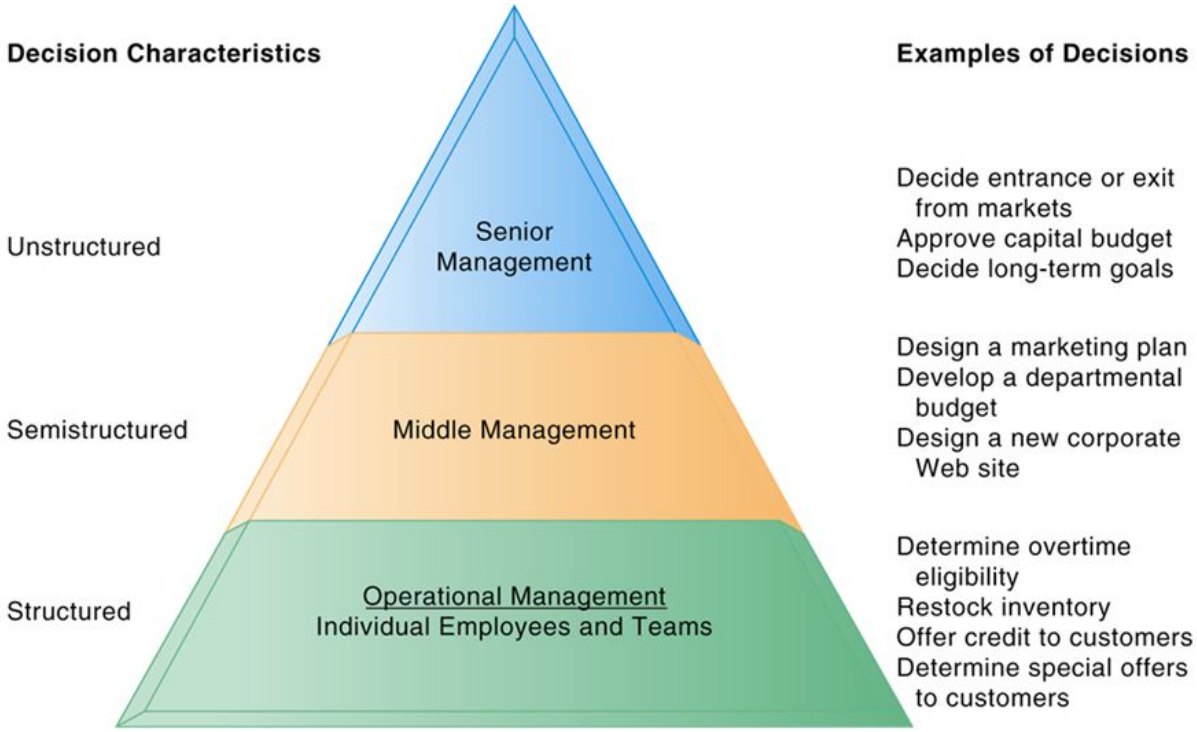
Benefit	How Achieved
Reduce time to market	• By connecting design, research and development, procurement, manufacturing, and customer service seamlessly through a flexible collaboration environment • By improving collaboration among the organization and its suppliers, contract manufacturers, and OEMs
Reduce costs	• By reducing prototyping costs through the use of software simulation • By reducing scrap and rework through improved processes • By reducing the number of product components through standardization
Ensure regulatory compliance	• By providing a secure repository, tracking and audit trails, change and document management controls, workflow and communications, and improved security

Challenges implementing Enterprise Systems

TABLE 8.6 Challenges to successful enterprise system implementation

Challenge	Description
Cost and disruption of upgrades	Most companies have other systems that must be integrated with the enterprise system, such as financial analysis programs, e-commerce operations, and other applications that communicate with suppliers, customers, distributors, and other business partners. Integration of multiple systems adds time and complexity to an ERP implementation.
Cost and long implementation lead time	The average ERP implementation cost is $5.5 million with an average project duration of just over 14 months.
Difficulty in managing change	Companies often must radically change how they operate to conform to the enterprise work processes. These changes can be so drastic to longtime employees that they depart rather than adapt to the change, leaving the firm short of experienced workers.
Management of software customization	The base enterprise system may need to be modified to meet mandatory business requirements. System customizations can become extremely expensive and further delay implementation.
User frustration with the new system	Effective use of an enterprise system requires changes in work processes and in the details of how work gets done. Many users initially balk at these changes and require extensive training and encouragement.

[04] Business Intelligence and Analytics



Important tasks of middle management

- Monitor: keep track of how business is functioning

- Problem solving: take action when a business does not function as required:
    - Production volume not achieved
    - Deadlines not made
    - Cost rise too high
    - …

Business Analytics

The extensive use of data and quantitative analysis to support fact-based decision making within organizations

Business analytics can be used to:

- Gain better understanding of current business performance
- Reveal new business patterns and relationships
- Explain why certain results occurred
- Optimize current operations
- Forecast future business results

Business Intelligence (BI)

üIncludes a wide range of applications, practices, and technologies for the extraction, transformation, integration, visualization, analysis interpretation, and presentation of data to support improved decision making.

Data used in BI is often pulled from multiple sources and may come from sources internal and external to the organization. Data can be used to build large collections of data called data warehouses, data marts, and data lakes

Business Intelligence and Analytics

BI analytics can be used to

- Detect fraud
- Improving forecasting
- Increase sales
- Optimize operations
- Reduce costs

Components

- Existence of a solid data management program, including data governance:
  Data governance defines the roles, responsibilities, and processes for ensuring that data can be trusted and used by the entire organization

- Infrastructure: Software, hardware and network infrastructure

- Creative data scientists

- Management team: Must have a strong commitment to data-driven decision making

Tools

- Spreadsheets
- Reporting and querying tools
- Data visualization tools
- Online analytical processing (OLAP)
- Drill-down analysis
- Linear regression

- Data Mining
- Dashboards

Spreadsheets

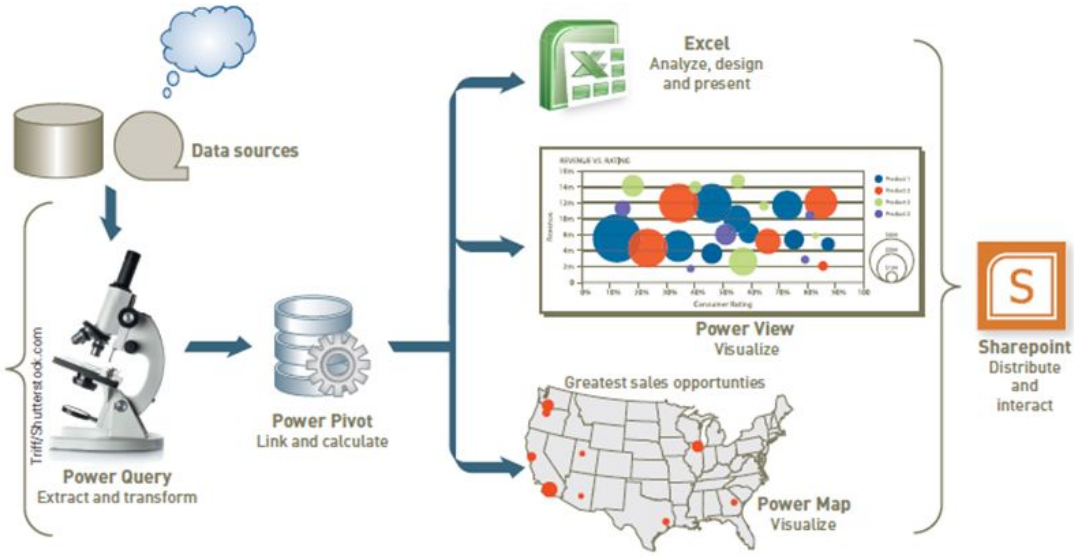


FIGURE 9.1

Components of Microsoft Power BI for Office 365

Microsoft Power BI has been used to better understand the clinical use of drugs, the efficacy of treatment, and the associated costs.

Source: Access Analytics, Power BI for Business, Power Analytics, *http://www.accessanalytic.com.au/Power-BI.html.*

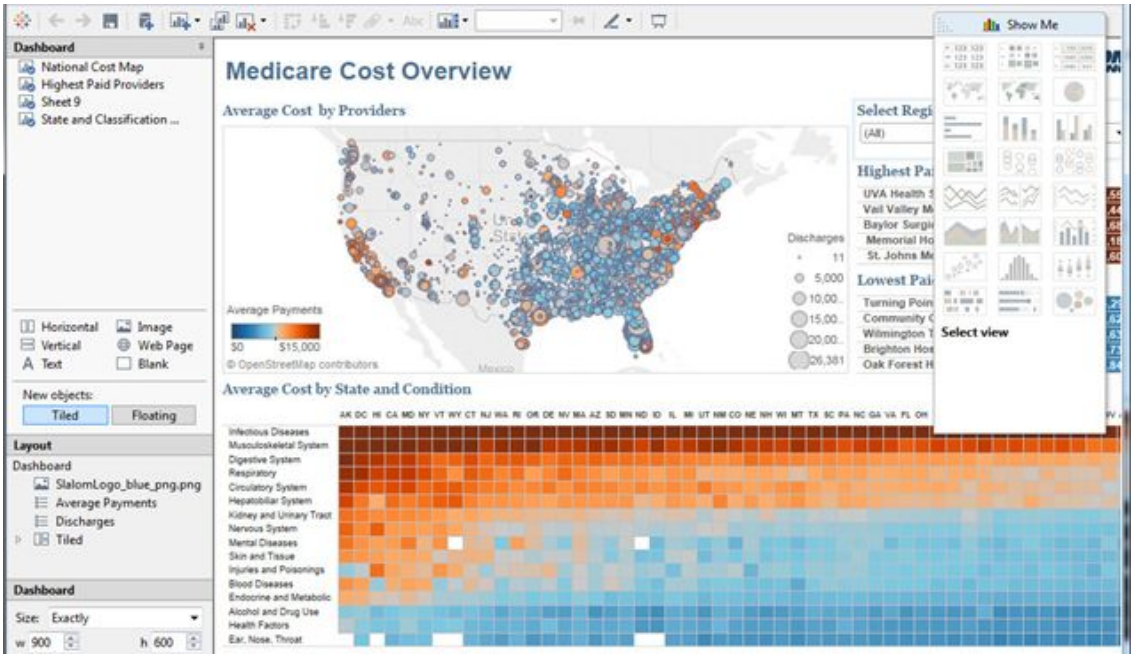
Data Visualization Tools

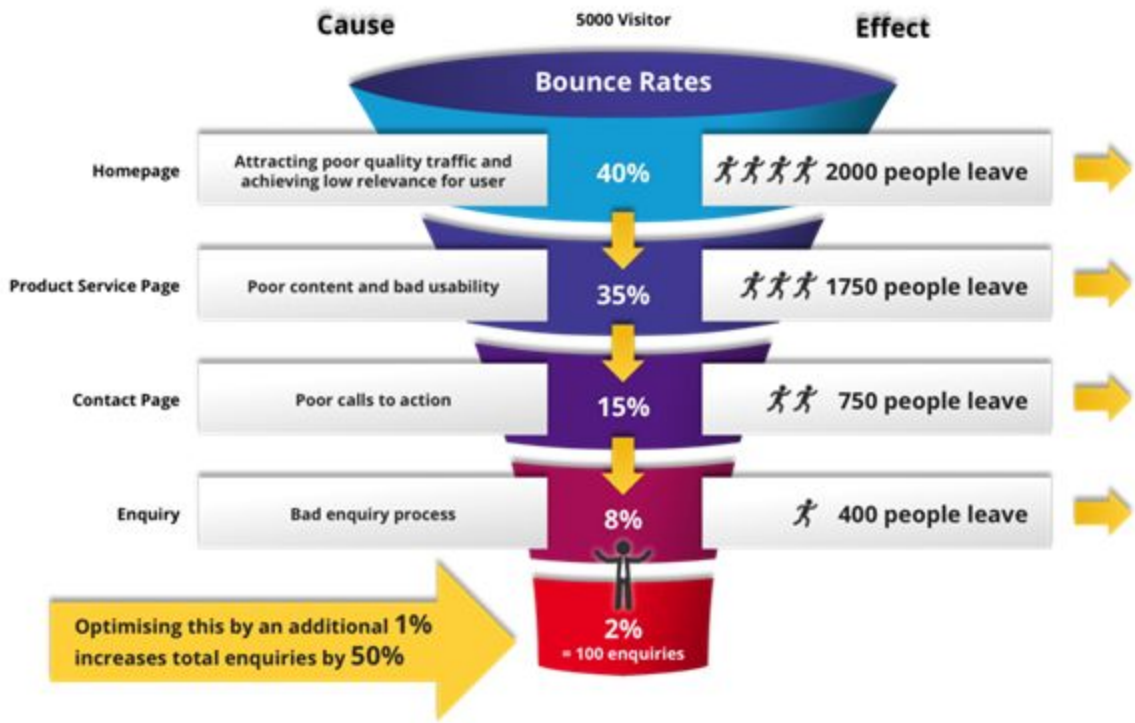
- Data visualization: The presentation of data in a pictorial or graphical format

- Representing data in visual form brings immediate impact to dull and boring numbers

- Word cloud: A visual depiction of a set of words that have been grouped together because of the frequency of their occurrence

- Conversion funnel: A graphical representation that summarizes the steps a consumer takes in making the decision to buy a product and become a customer





Online Analytical Processing (OLAP)

A method to analyze multidimensional data from many different perspectives.OLAP enables users to identify issues and opportunities and perform trend analysis.

Data cubes

Contain numerical facts called measures, which are categorized by dimensions, such as time

and geography. It can be built to summarize unit sales of a specific item on a specific day for a specific store.

Drill-Down Analysis

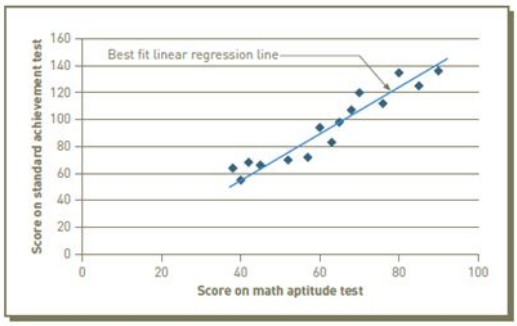
Drill-down analysis involves the interactive examination of high-level summary data in increasing detail to gain insight into certain elements

Example: In reviewing the worldwide sales for the past quarter, the VP of sales might want to drill down to view the sales for each country.

- Further drilling could be done to view the sales for a specific country for the last quarter
- A third level of drill-down analysis could be done to see the sales for a specific country for a specific month of the quarter
- A fourth level of analysis could be accomplished by drilling down to sales by product line for a particular country by month

Linear Regression

A mathematical technique for predicting the value of a dependent variable based on a single independent variable and the linear relationship between the two. Consists of finding the best-fitting straight line through a set of observations of the dependent and independent variables



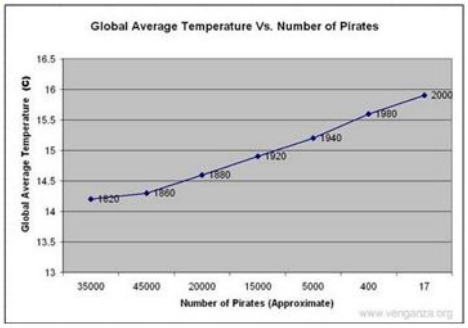


FIGURE 9.6
Simple linear regression
This graph shows a linear regression that predicts students' final exam scores based on their math aptitude test score.

Data Mining

A BI analytics tool used to explore large amounts of data for hidden patterns to predict future trends and behaviors for use in decision making.

Most commonly used data mining techniques

- Association analysis: a specialized set of algorithms sorts through data and forms statistical rules about relationships among the items

- Neural computing: historical data is examined for patterns that are then used to make predictions

- Case-based reasoning: historical if-then-else cases are used to recognize patterns

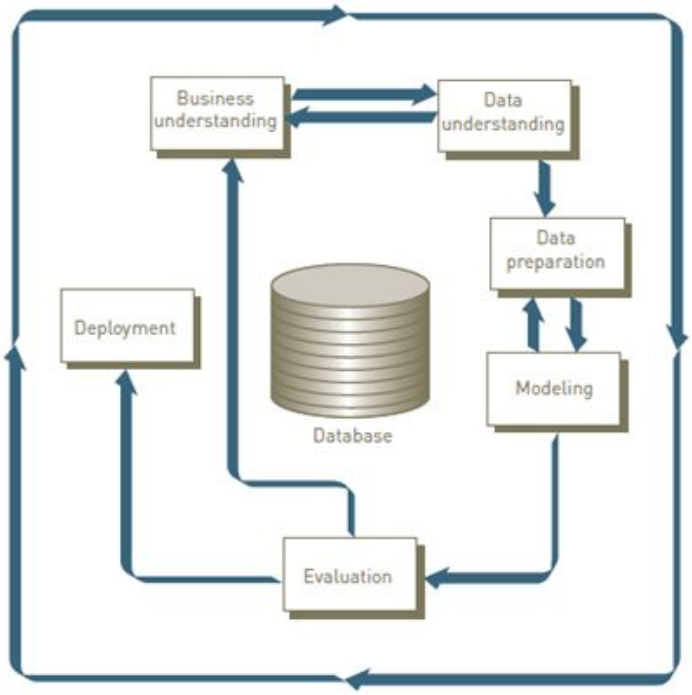


FIGURE 9.7
The Cross-Industry Process for Data Mining (CRISP-DM)
CRISP-DM provides a structured approach for planning and executing a data mining project.
Source: Piatetsky, Gregory, "CRISP-DM, Still the Top Methodology for Analytics, Data Mining, or Data Science Projects," KDNuggets, October 28, 2014, *www.kdnuggets.com/2014/10/crisp-dm-top-methodology-analytics-data-mining-data-science-projects.html*.

TABLE 9.1 Goals for each phase of CRISP-DM

Phase	Goal
Business understanding	• Clarify the business goals for the data mining project, convert the goals into a predictive analysis problem, and design a project plan to accomplish these objectives.
Data understanding	• Gather data to be used (may involve multiple sources), become familiar with the data, and identify any data quality problems (lack of data, missing data, data needs adjustment, etc.) that must be addressed.
Data preparation	• Select a subset of data to be used, clean data to address quality issues, and transform data into form suitable for analysis.
Modeling	• Apply selected modeling techniques.
Evaluation	• Assess if the model achieves business goals.
Deployment	• Deploy the model into the organization's decision-making process.

Source: Leaper, Nicole, "A Visual Guide to CRISP-DM Methodology," *https://exde.files.wordpress.com/2009/03/crisp_visualguide.pdf*, accessed January 20, 2016.

Examples showing how data mining can be used:

- Based on past responses to promotional mailings, identify those consumers most likely to take advantage of future mailings

- Examine retail sales data to identify seemingly unrelated products that are frequently purchased together

- Monitor credit card transactions to identify likely fraudulent requests for authorization

- Use hotel booking data to adjust room rates so as to maximize revenue

- Analyze demographic data and behavior data about potential customers to identify those who would be the most profitable customers to recruit

- Study demographic data and the characteristics of an organization's most valuable employees to help focus future recruiting efforts

- Recognize how changes in an individual's DNA sequence affect the risk of developing common diseases such as Alzheimer's or cancer

Dash Boards

Presents a set of KPIs about the state of a process at a specific point in time. A dashboard can provide rapid access to information i n an easy to-interpret and concise manner. It can also provide users at every level of the organization the information they need to make improved decisions.

Operational dashboards can be designed to draw data in real time from various sources, including corporate databases and spreadsheets

Widely used BI software comes from many different vendors, including: Hewlett Packard, IBM, Information Builders, Microsoft, Oracle, and SAP

LQ Revenue	LQ Profit	Category	Revenue	Profit	Sell-through %	Order Count	Units Received	End on hand
$415,170	$95,792	Books	$424,806	$84,246	96.8%	27,470	495	911
$6,049,738	$1,120,100	Electronics	$6,594,912	$1,019,298	99.6%	19,671	4,810	2,526
$279,571	$22,207	Movies	$298,973	$14,955	63.7%	19,396	21,685	13,075
$243,392	$19,623	Music	$254,771	$12,121	55.7%	17,654	27,865	14,064

FIGURE 9.8

Category management dashboard for total U.S. region

This dashboard summarizes a number of sales measures.

Source: *www.microstrategy.com/us/analytics/technology*.

FIGURE 9.8

Category management dashboard for total U.S. region

This dashboard summarizes a number of sales measures.

Source: *www.microstrategy.com/us/analytics/technology*.

Big Data

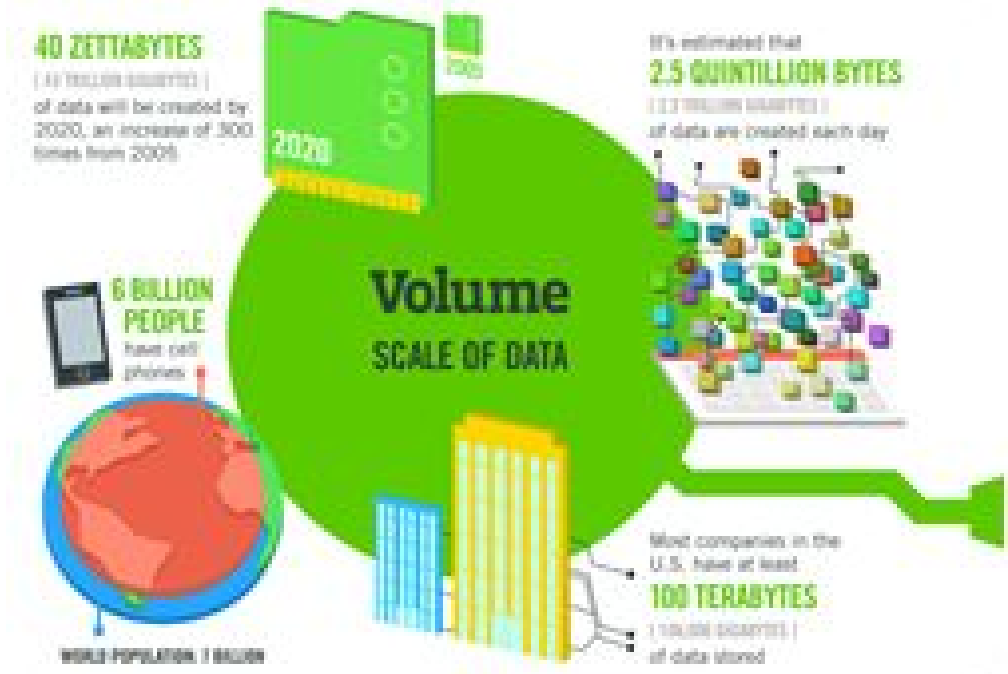
Big data is a term used to refer to data sets that are too large or complex for traditional data-processing software to deal with.

The 4V's of Big Data

What defines Big Data:

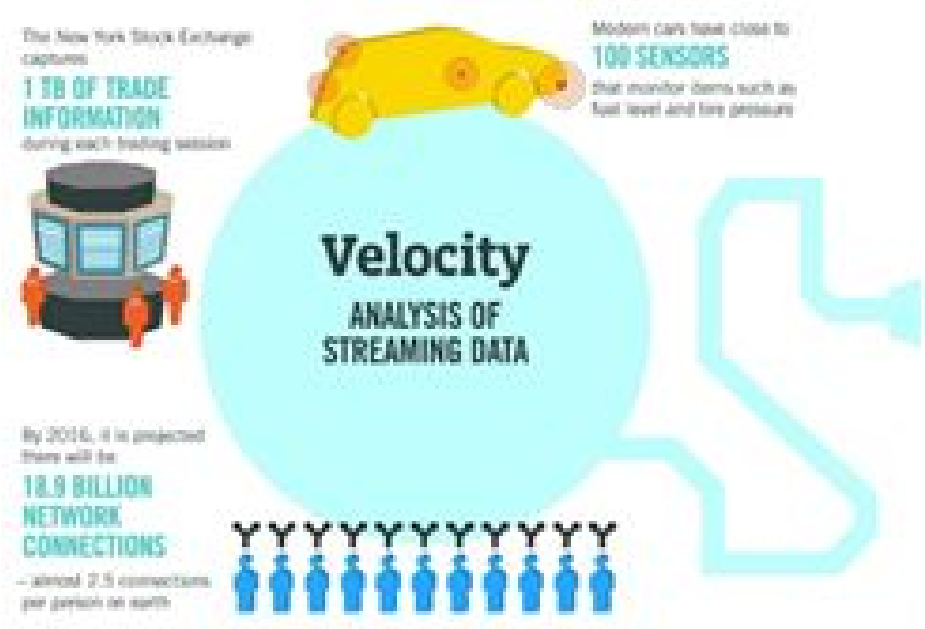
- Volume
- Velocity
- Veracity
- Variety

Volume



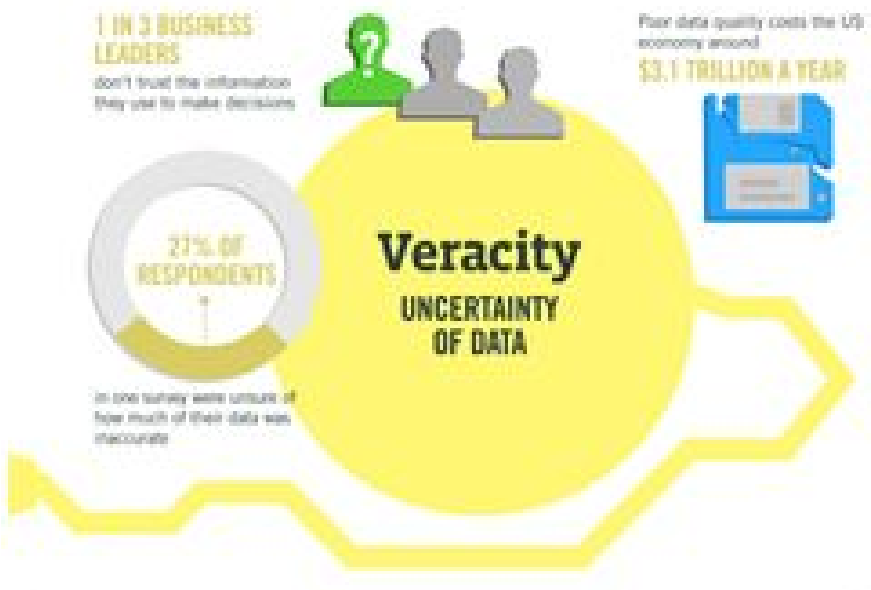
Large volume of data that either consume huge storage or consist of large number of records.

Velocity



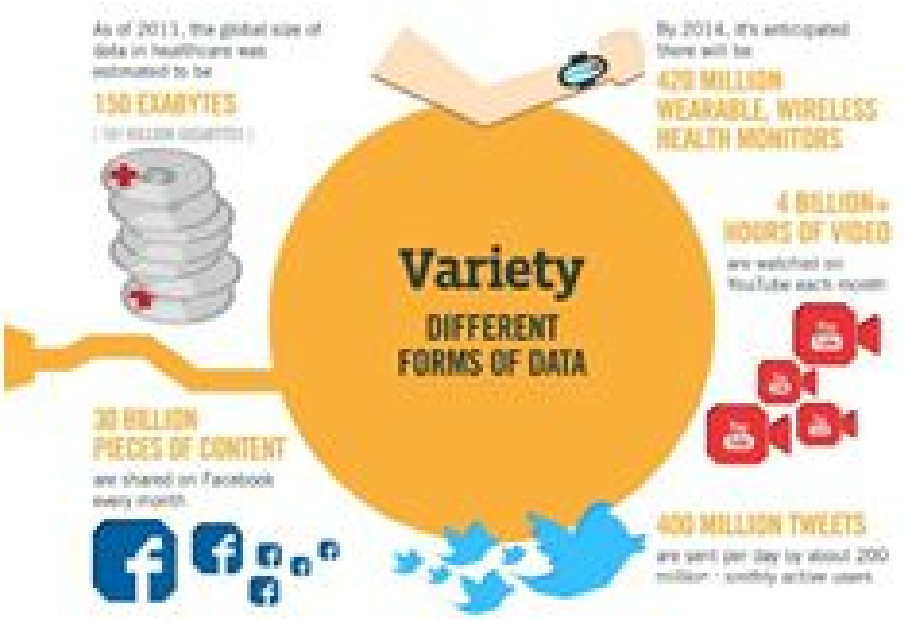
Velocity reflects the speed at which data are collected and analyzed, whether in real time or near real time.

Veracity

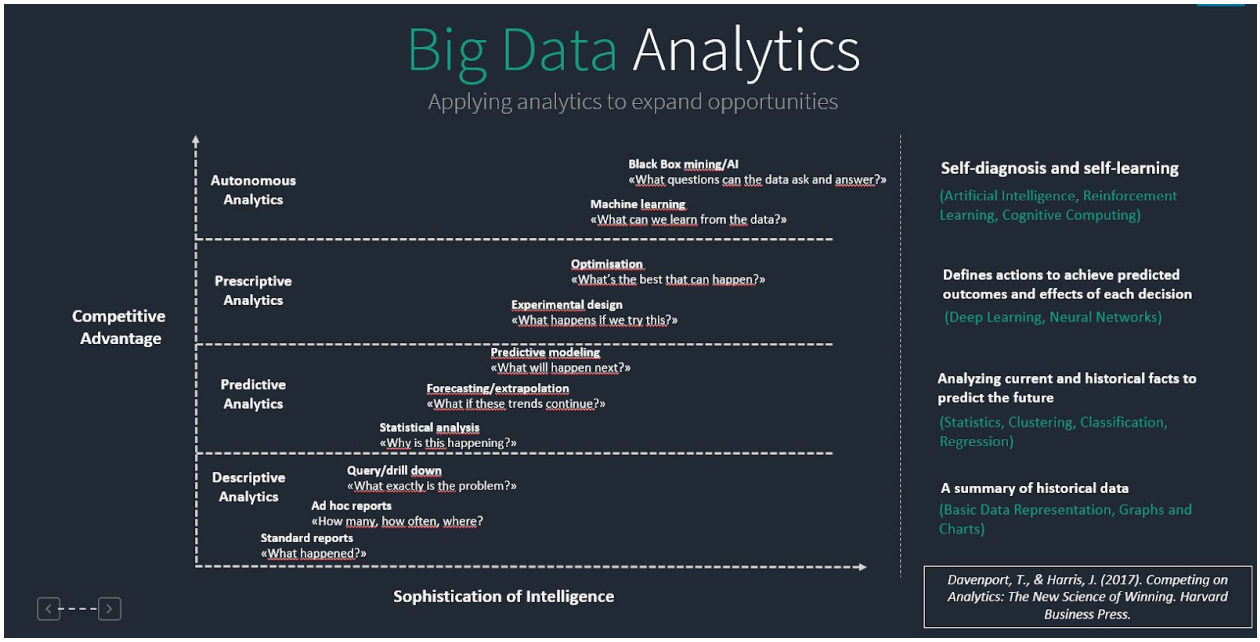


The data quality of captured data can vary greatly, affecting the accuracy analysis (=> shit in, shit out)

Variety



Variety in Big Data comes from the plurality of structured and unstructured data sources.



Types of value creation from Big Data

- Transparency: Making Big Data more easily accessible to relevant stakeholders in a timely manner.

- Decision Making: Big data can substantially improve decision making, minimize risks, and unearth valuable insights that would otherwise remain hidden.

- Marketing: Big data allows organizations to create highly specific segmentations and to tailor products and services precisely to meet those needs

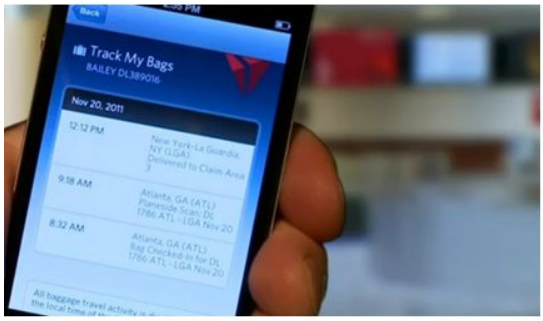
- Performance: Big data can enable organizations to collect more accurate and detailed performance data (in real or near real time)

- Innovation: Big data enables companies to create new products and services, enhance existing ones, and invent entirely new business models.

Transparency

New forms of information presentation

DELTA



Delta Airlines

Delta is one of the three major United States airlines with headquarters in Atlanta, Georgia, USA.

With over 130 million bags checked per year, the company held a lot of tracking data about bags and became the first major airline to allow customers to track their bags from mobile devices in real-time by adding RFID's in the bag tags.

To date, the app has been downloaded over 11 million times and gives customers much greater peace of mind while traveling while also differentiating Delta as a customer-centric company.

Decision Making

Real-time and better informed decisions

UPS

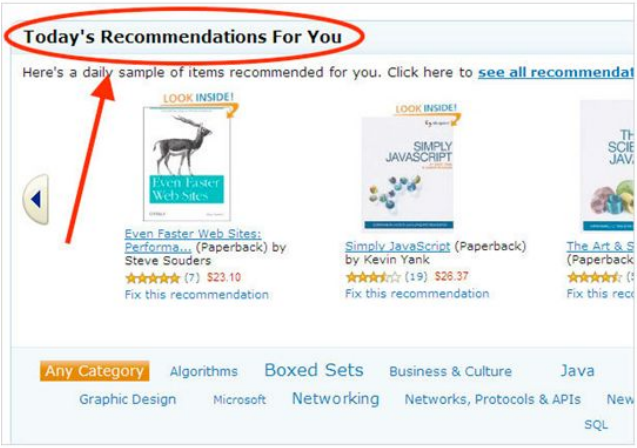
UPS more than 18 million package and document deliveries every day and over 4 billion items shipped per year through almost 100,000 vehicles.

On-truck telematics and advanced algorithms help with routes, engine idle time, and predictive maintenance. It also uses ORION (On-road Integrated Optimization and Navigation) to create optimal routes for delivery drivers from the data supplied by customers, drivers and the vehicles.

Since starting the program, the company has saved over 148 million liters of fuel, avoided driving 582 million kilometers and reduced engine idle time by 206 million minutes.

Marketing

Getting to know customers better



Amazon

Segmentation of population to customize offerings and marketing campaigns (consumer goods, retail, social, clinical data, etc).

The company reported a 29% sales increase to $12.83 billion during its second fiscal quarter, up from $9.9 billion during the same time in 2012.

The retail giant's recommendation algorithms are based on seemingly few elements: a user's purchase history, items in their shopping cart, items they've rated and liked, and what other customers have viewed and purchased.

The importance of suggesting the right item to the right user can be gauged by the fact that 35% of all sales are estimated to be generated by the recommendation engine.

Performance

Fine-tuning performance

Southwest Airlines

Exploration for, and discovery of, new needs, can drive organizations to fine tune for optimal performance and efficiency (employee data).

Southwest Airlines, is using speech analytics to extract data-rich info from live-recorded interactions between customers and personnel to get a better understanding of their customers.

Speech analytics help the airline to have maximum information about the customer beforehand.

Whenever a customer calls his voice is organized by a speech engine and his recent queries and important data are displayed which helps in improving interaction.

Innovation

Driving new products and services

BlackRock Investment Group

BlackRock, Inc. is an American global investment management corporation based in New York City and is the world's largest asset manager with $6.29 trillion in assets under management as of December 2017.

BlackRock has set up a new center dedicated to research in artificial intelligence, underscoring the heightened interest among asset managers in how machine learning can revolutionize many facets of the investment industry.

BlackRock is already analyzing traffic through corporate websites as an indicator to the future growth of a company. It also employs text analysis tools to comb through transcripts of earnings calls, looking for signs of whether management team is positive or negative about their company's growth prospects.

Knowledge Management

Comprises a range of practices concerned with increasing awareness, fostering learning, speeding collaboration and innovation, and exchanging insights. It's used by organizations to

enable individuals, teams, and entire organizations to collectively and systematically create, share, and apply knowledge in order to achieve objectives.

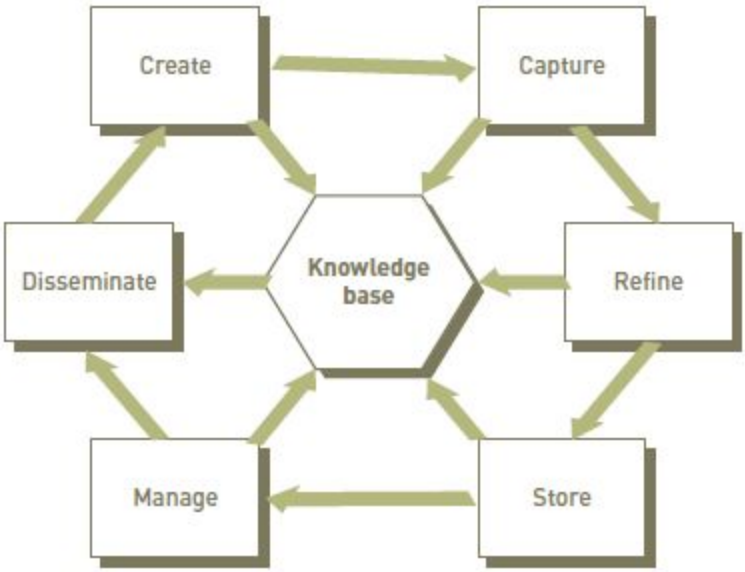


FIGURE 10.1
Knowledge management processes
Knowledge management comprises a number of practices.
Source: From Reynolds, Information Technology for Managers, 2E. © 2016 Cengage Learning.

Knowledge

- Explicit knowledge:
  - Objective
  - Can be measured and documented in reports, papers, and rules

- Tacit Knowledge
  - Typically not objective or formalized
  - Hard to measure and document
  - Two processes used to capture tacit knowledge:
    - Shadowing
    - Joint problem solving

Many organizations attempt to convert tacit knowledge to explicit knowledge

TABLE 10.1 Explicit and tacit knowledge

Asset Type	Description	Examples
Explicit knowledge	Knowledge that is documented, stored, and codified	Customer lists, product data, price lists, a database for telemarketing and direct mail, patents, best practices, standard procedures, and market research results
Tacit knowledge	Personal knowledge is not documented but embedded in individual experience	Expertise and skills unique to individual employees, such as how to close a sale or troubleshoot a complex piece of equipment

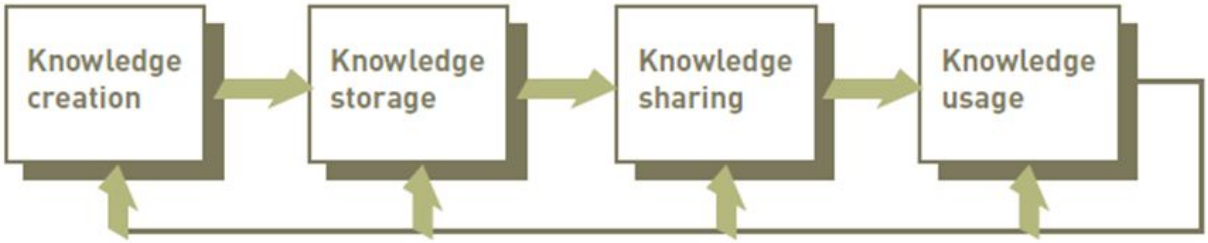
Data consists of raw facts. They can be “transformed” to:

- Information: Collection of facts organized so that they have additional value beyond the value of the facts themselves

- Knowledge: Awareness and understanding of a set of information and the ways that information can be made useful to support a specific task or reach a decision.

Knowledge Management System (KMS)

Organized collection of people, procedures, software, databases, and devices. It is used to create, store, share, and use the organization's knowledge and experience.

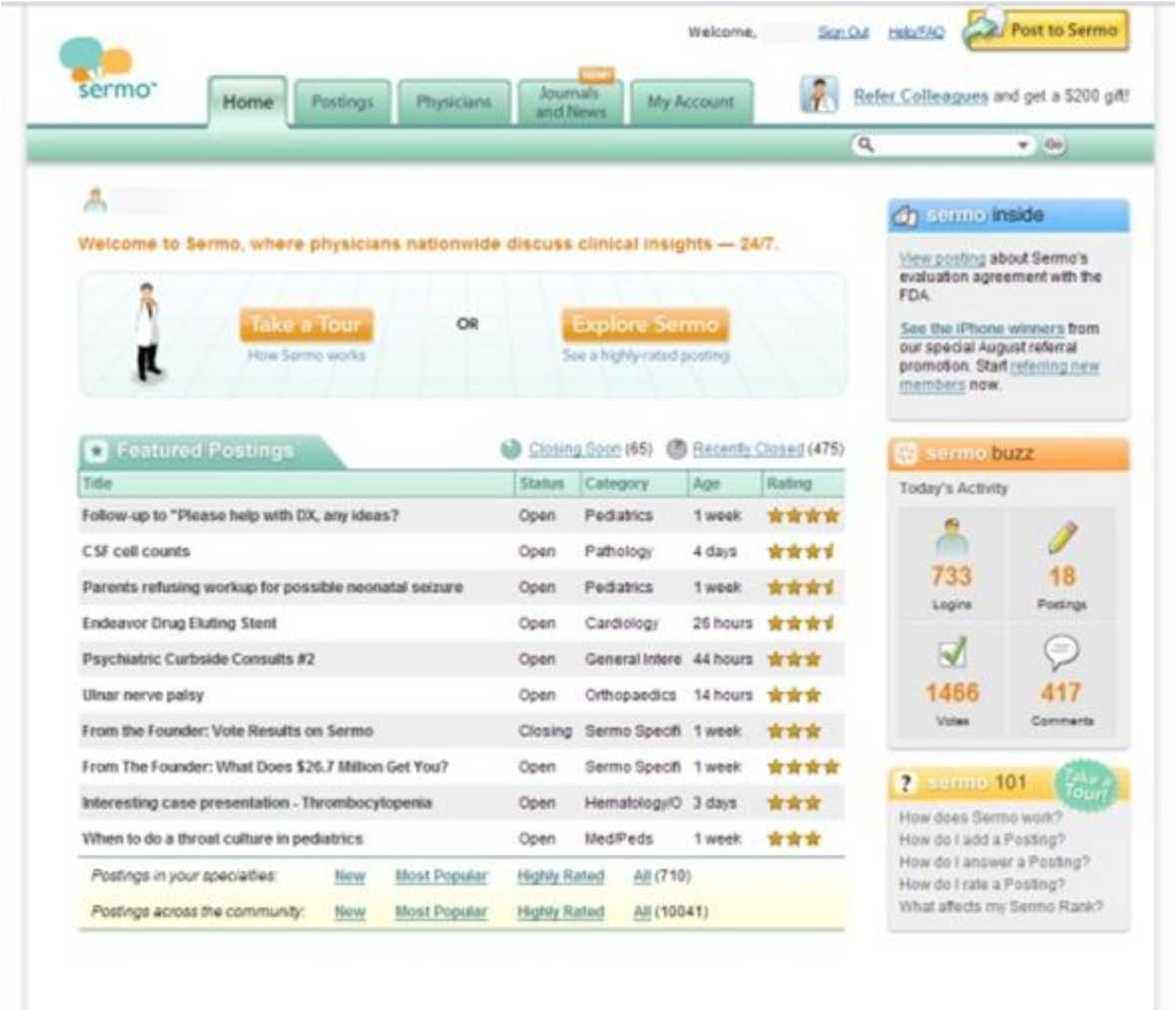


Technologies that support KM

- Communities of practice
- Organizational network analysis
- Web 2.0 technologies
- Business rules management systems
- Enterprise search tools

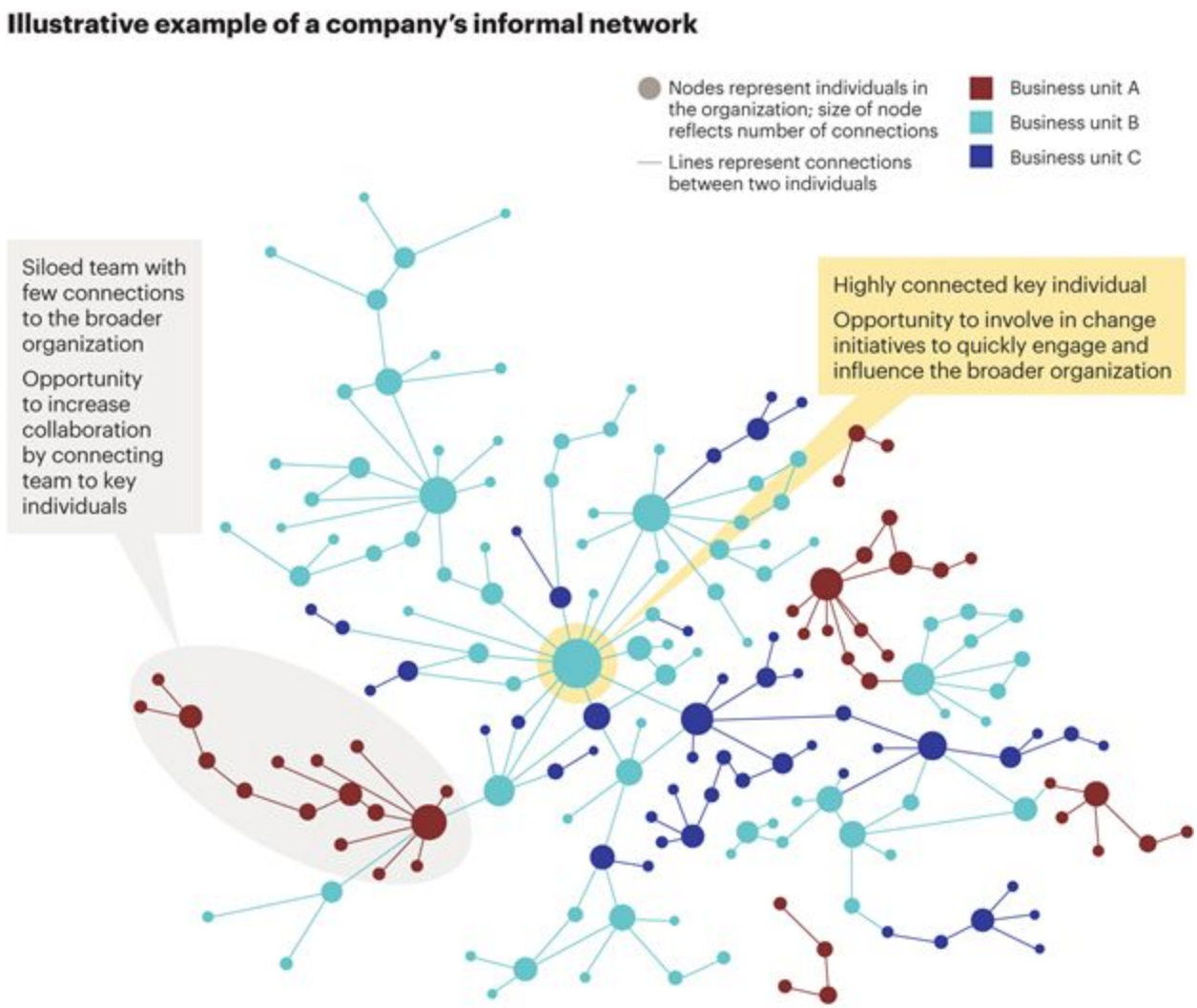
Communities of Practice (COP)

Groups of people with common interests. Members come together to create, store, and share knowledge on a specific topic. The groups typically develop resources such as models, tools, documents, processes, and terminology that represents the accumulated knowledge of the community.



Organizational Network Analysis

A technique used for documenting and measuring flows of information among individuals, workgroups, organizations, computers, web sites, and other information sources.



Each node in the diagram (above) represents a knowledge source. Each link represents a flow of information between the two nodes.

ONA has many knowledge management applications, ranging from mapping knowledge flows and identifying knowledge gaps to helping establish collaborative networks.

Web 2.0 Technologies

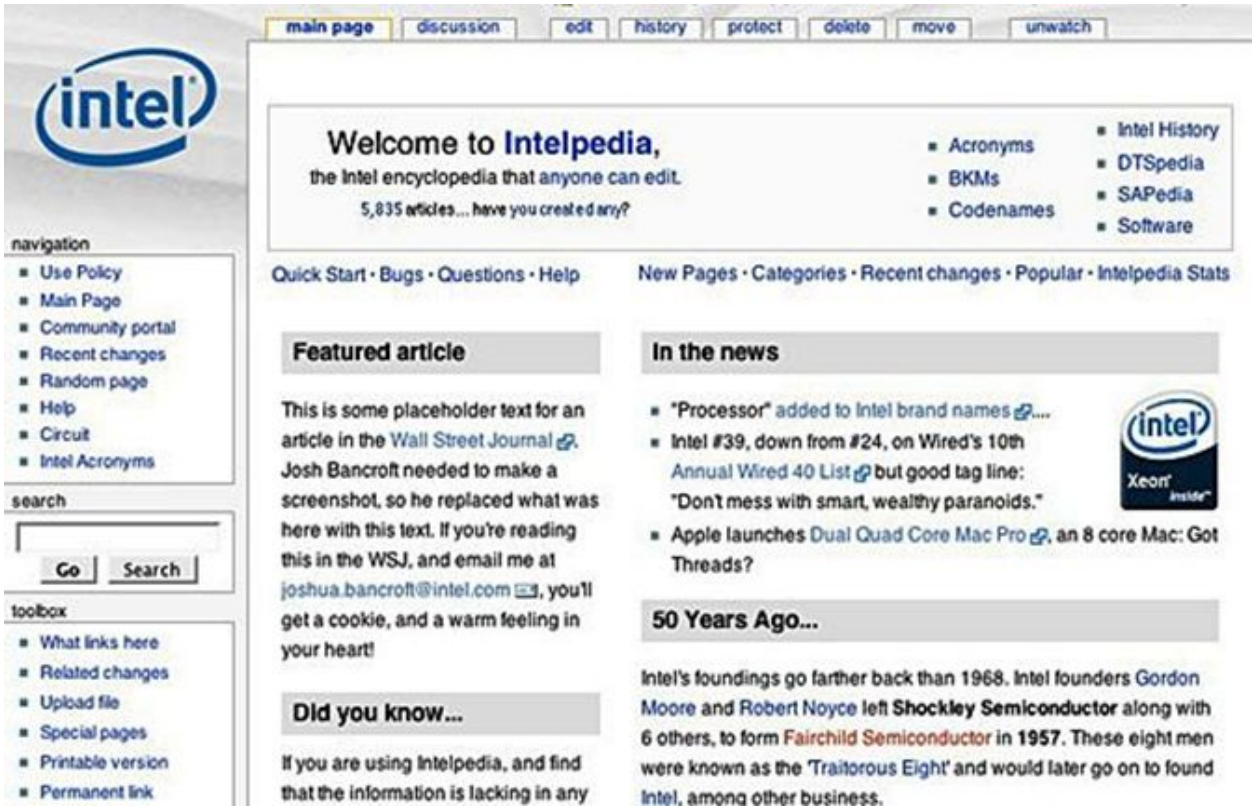
"Web 2.0" is a term describing changes in technology and website design to enhance:

- Information sharing
- Collaboration
- Functionality on the Web

Examples of 2.0 technologies:

- Blogs

- Forums
- Podcasts
- RSS news feeds
- Wikis



Artificial Intelligence (AI)

Computers with the ability to mimic or duplicate the functions of the human brain.

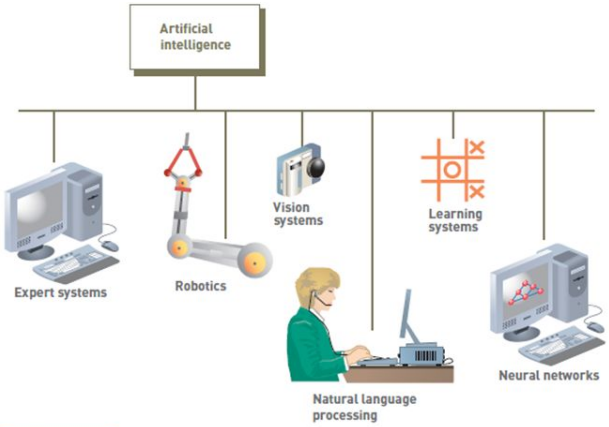
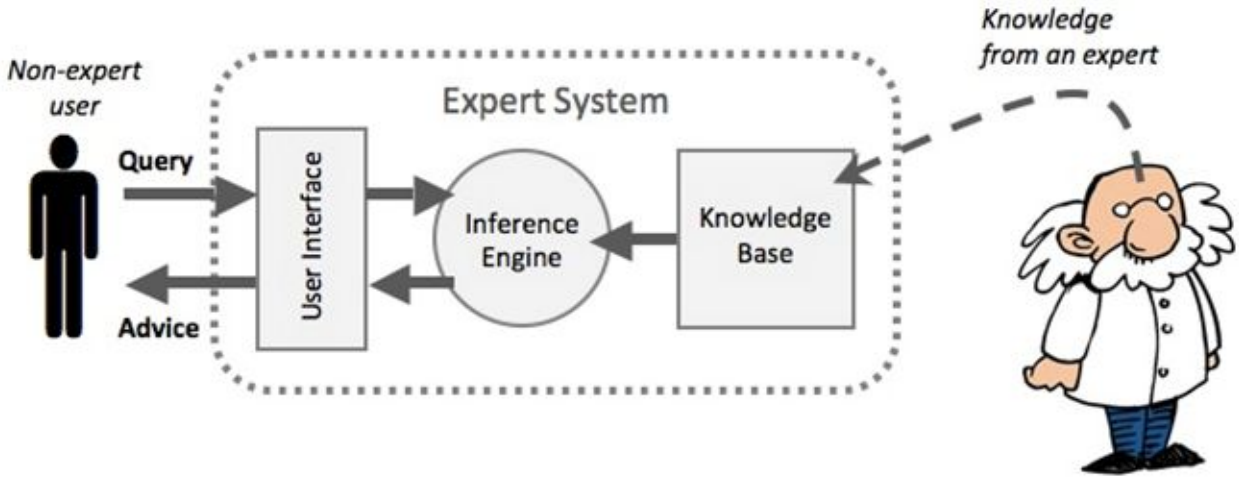


FIGURE 10.7
Conceptual model of artificial intelligence
AI is a broad field that includes several specialty areas.

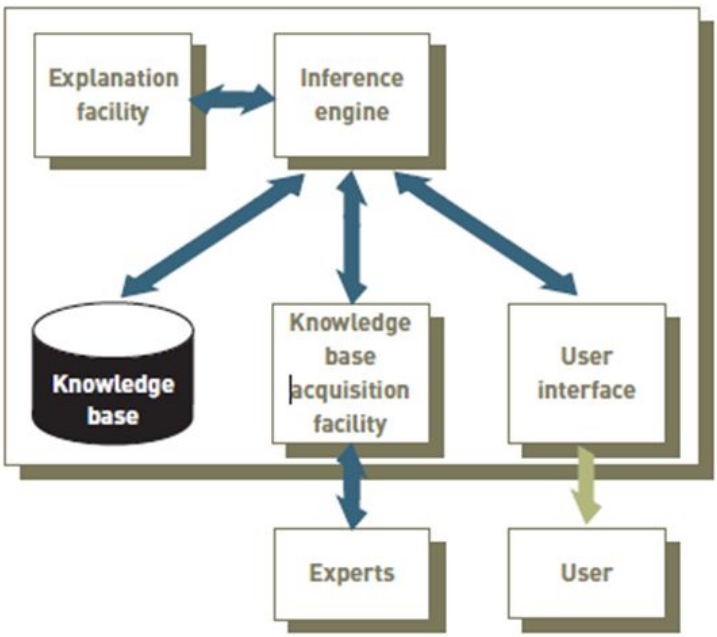
Expert Systems

Hardware and software that stores knowledge and makes inferences, similar to a human expert. It is used in many business applications. Computerized expert systems use heuristics, or rules of thumb, to arrive at conclusions or make suggestions.



An expert system, consists of a collection of integrated and related components:

- Knowledge base
- Inference engine
- Explanation facility
- Knowledge base acquisition facility (domain expertise)
- User interface

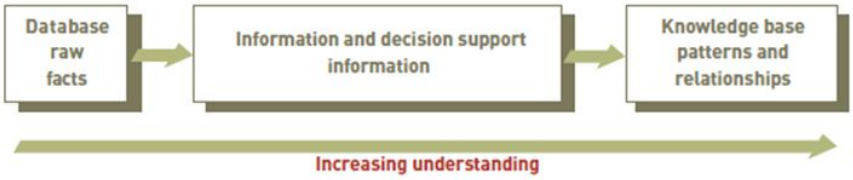


Knowledge base

Stores relevant information, data, rules, cases, and relationships that the expert system uses.

- Rule: a conditional statement that links conditions to actions or outcomes. They may be stored as IF-THEN statements

FIGURE 10.9
Relationships between data, information, and knowledge
A knowledge base stores all relevant information, data, rules, cases, and relationships that an expert system uses.



Inference Engine

Main purpose of this component is to seek information and relationships from the knowledge base to provide answers, predictions, and suggestions like a human expert.

Explanation facility

Allows a user or decision maker to understand how the expert system arrived at certain conclusions or results. It indicates all the facts and rules that were used in reaching the conclusion.

Example: A doctor can find the logic or rationale of a diagnosis made by a medical expert system.

Robotics

Robotics is a branch of engineering that involves developing and manufacturing mechanical devices that can: paint cars, make precision welds, and other tasks that require a high degree of precision. Organizations use robots to perform dull, dirty, and/or dangerous jobs.

Vision Systems

Hardware and software that permit computers to capture, store, and manipulate visual images and pictures.

Example of application:

- Increased accuracy and speed in industrial inspections
- Identifying people based on facial features

Natural Language Processing (NLP)

Involves the computer understanding, analyzing, manipulating, and/or generating “natural” languages such as English

Example of application:

- Voice recognition: Converting sound waves into words. After the conversation, natural language-processing systems react to words by performing a variety of tasks

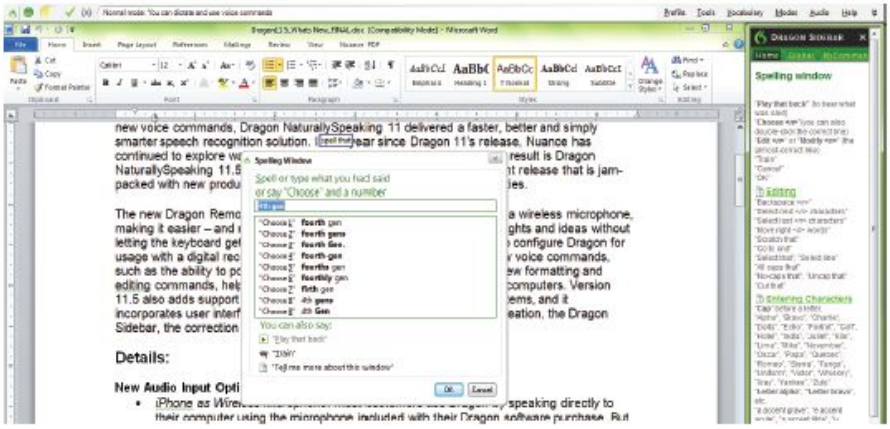


FIGURE 10.11

Voice recognition software

With the NaturallySpeaking application from Dragon Systems, computer users can speak and have their words transcribed into text for input to software such as Microsoft Word.

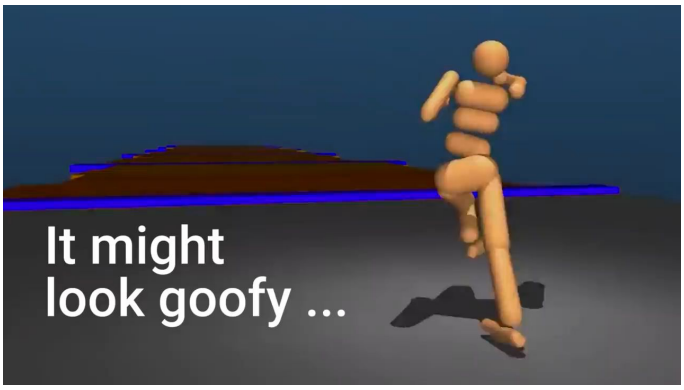
Source: Nuance Communications.

Learning Systems

A combination of software and hardware that allows the computer to change how it functions or reacts to situations based on the feedback it receives (reinforcement learning).

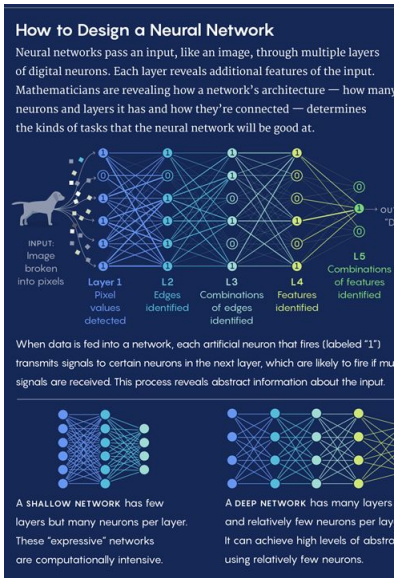
Learning system software:

- Feedback on the results of actions or decisions is required
- Feedback must indicate whether results are desirable or undesirable



Neural Networks (Bio)

Computer systems that can recognize and react on patterns or trends that it detects in large sets of data. It employs massively parallel processors in a mesh-like architectural structure. AI Trilogy is a neural network software program that can run on a *standard* PC.



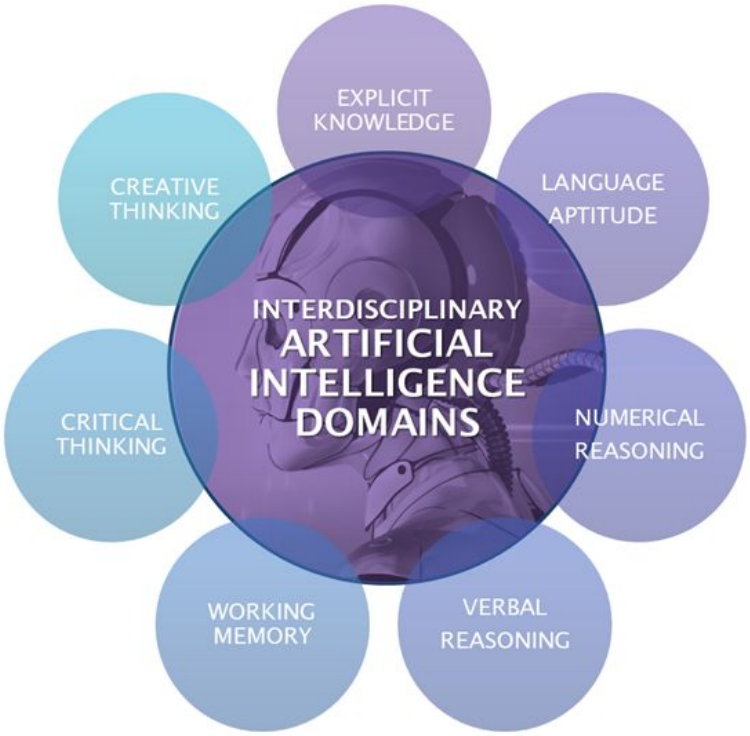
Artificial Intelligence Systems

The people, procedures, hardware, software, data, and knowledge needed to develop computer systems and machines that can simulate human intelligence processes including:

- Learning
- Reasoning
- Self-correction

Ai is a complex interdisciplinary field, and it involves:

- Biology
- Computer Science
- Linguistics
- Mathematics
- Neuroscience
- Philosophy
- Psychology



Intelligent behaviour

Includes the ability to:

- Learn from experiences and apply knowledge acquired from experience

- Handle complex situations
- Solve problems when important information is missing
- Determine what is important
- React quickly and correctly to a new situation
- Understand visual images
- Process and manipulate symbols
- Be creative and imaginative
- Use heuristics

Brain Computer Interface (BCI)

The idea is to directly connect the human brain to a computer and have thought control computer activities. Realization of the BCI experiment will e.g. allow people to control computers and artificial components such as arms and legs through thought alone.

Example -> NEUROLINK

[05] Modeling IS and BPMN

Agenda

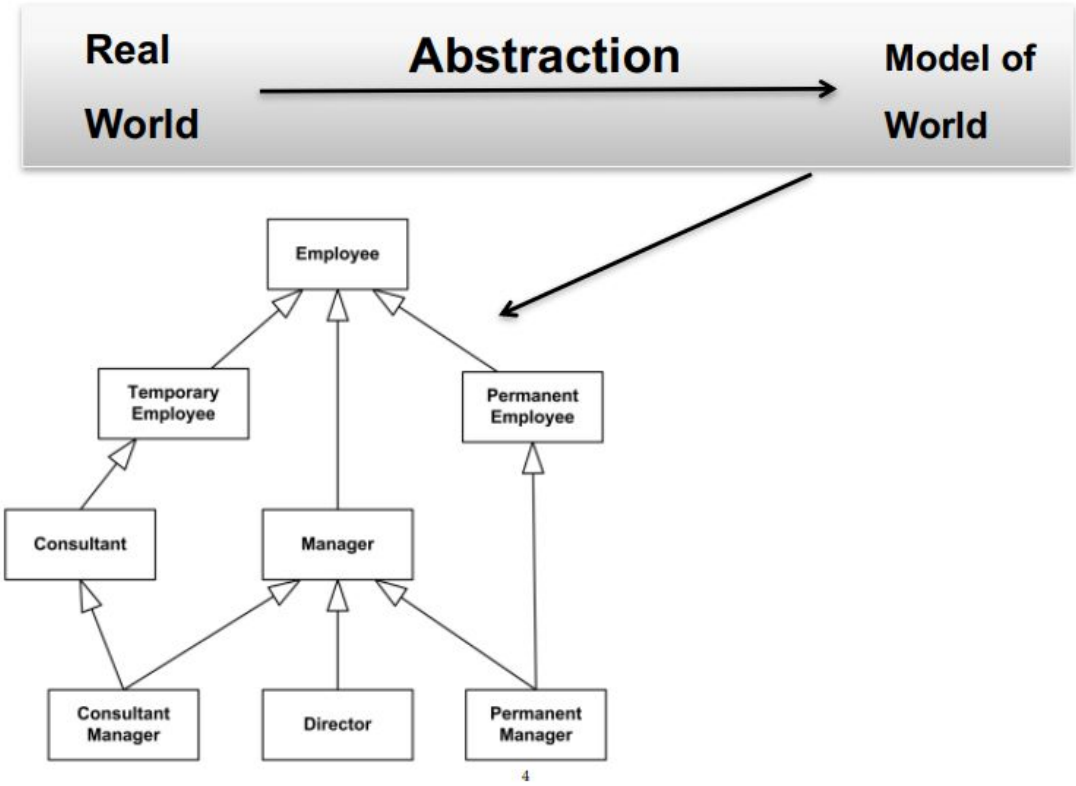
- **Use of modeling in IS-development**
- **Process modeling with focus on BPMN**

Characteristics of models

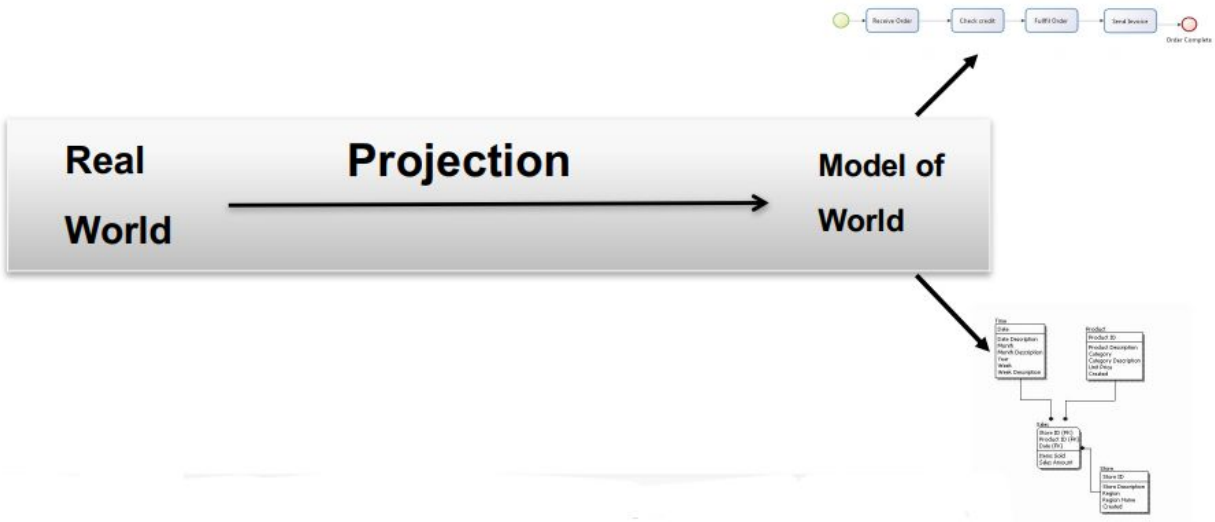
- Highlights the essentials of (part of) reality.
- Quicker and cheaper to make than the full artifact, but similar, so that it is often possible to spot consequences of decisions e.g. by means of analysis, simulation, inspection etc.
- Risk-free (although not effort-free) testing I what-if scenarios I accident simulation.
- Important for producing more innovative results of better quality.

Models

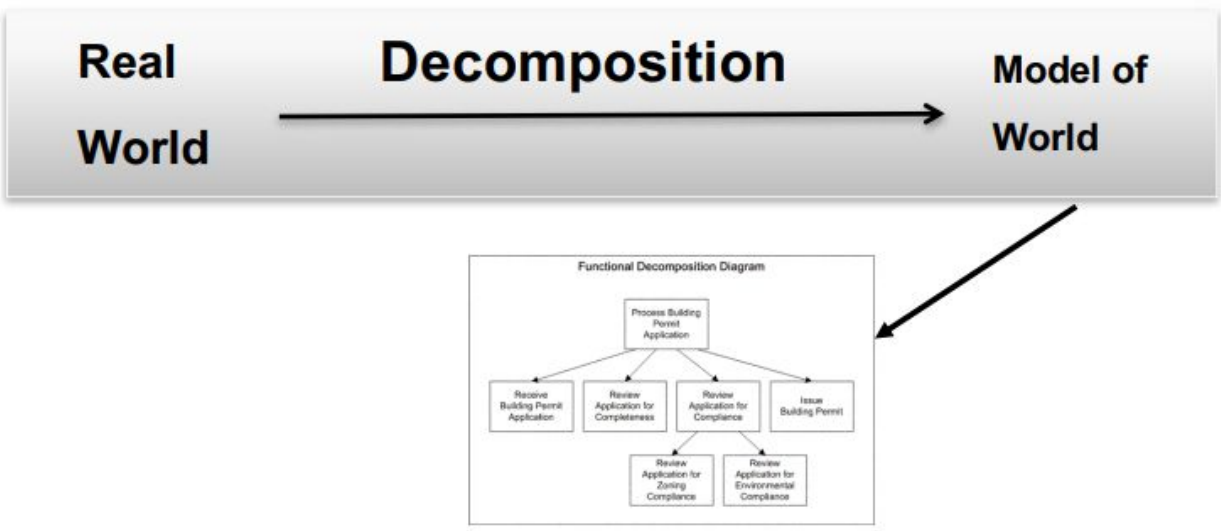
View: Abstraction



View: Projection



View: Decomposition



Transition System

A *transition system* is a triple (S, TR, s_0) where S is a finite state space, $TR \leq S x S$ is a transition relation containing all possible changes, and s_0 is the initial state.

ATM: S = (…), TR = (…).

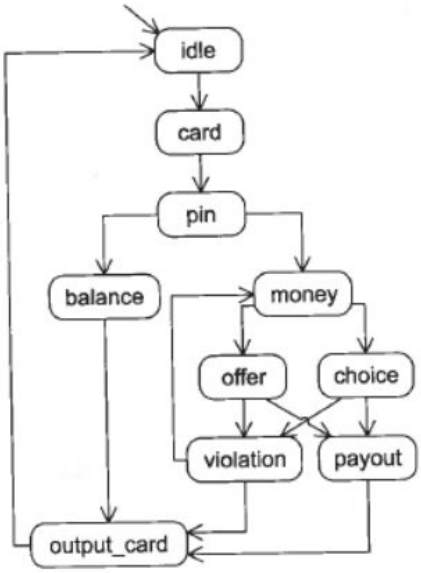


Figure 1.3
A state-transition diagram of the ATM.

11

Problems with transition systems

- State spaces are not finite and often complex
- Transitions not deterministic, conditional, complex…

Solutions:

- State såace: structural modeling in UML class diagrams, etc.
- Transition system: functional modeling in DFD, UML AD, BPMN, etc.

Business Processes and IS

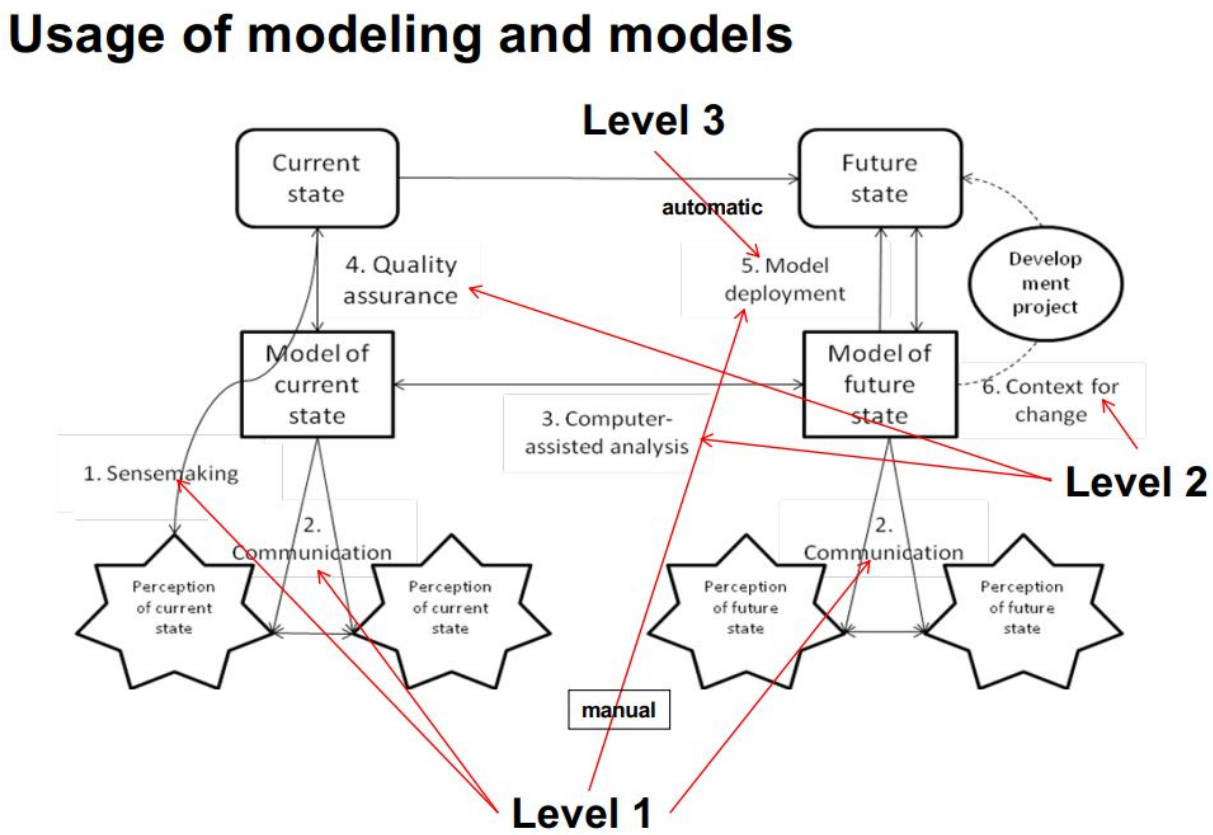
- A **business process** consists of a set of activities that are performed in an organization. These activities are coordinated to jointly realize a business goal. Each business process is enacted by a single organization, but it may interact with business processes performed by other organizations.
- Modeling of business process (to understand, agree and support them) is a central activity in information systems development.
- Capture many (but not all) high-level requirements and constraints of the system

BPMN

- Leading standard for modeling in BPM
- Business Process Modeling/Business Process Management
- 1. version in 2004, OMG standard in 2006, current version (2.0) published in 2011
- A number of tools, although none includes all parts of the language, most cover the main subset we will use in this course
- Support for model-interchange and model execution
- Not appropriate for all sorts of process modeling

Three Levels of use

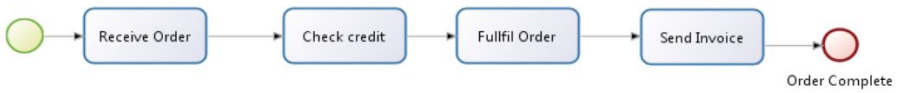
- Level 1: Descriptive modeling – geared towards simply documenting the process flow – (focus in this course)
- Level 2: Analytical modeling – More accurate with respect to exceptions and events. Supports qualitative and quantitative analysis
- Level 3: Executable modeling – graphical models that can be transformed into XML-based specifications that drive process engines.



BPMN Level 1 - Descriptive Modelling

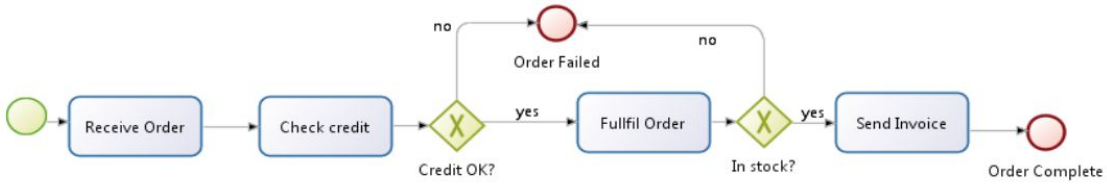
A Simple Order Process

- **A simple description of the happy path.**

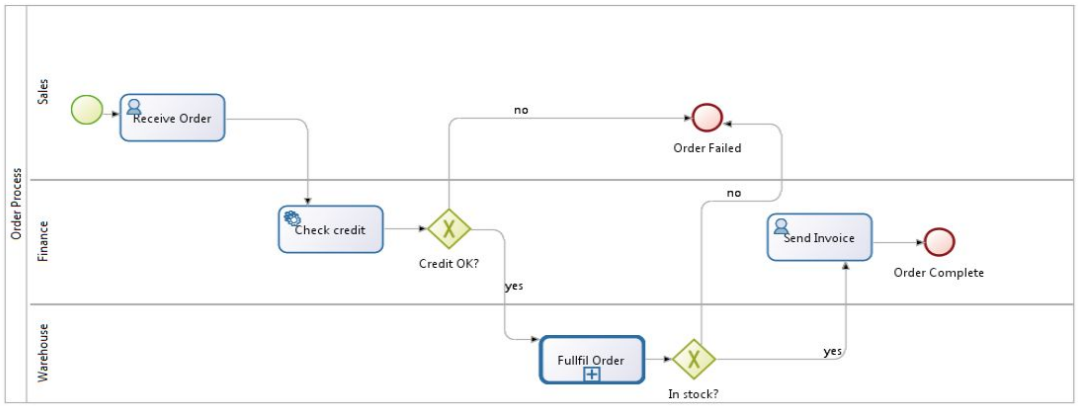


Order Process With Exception Paths

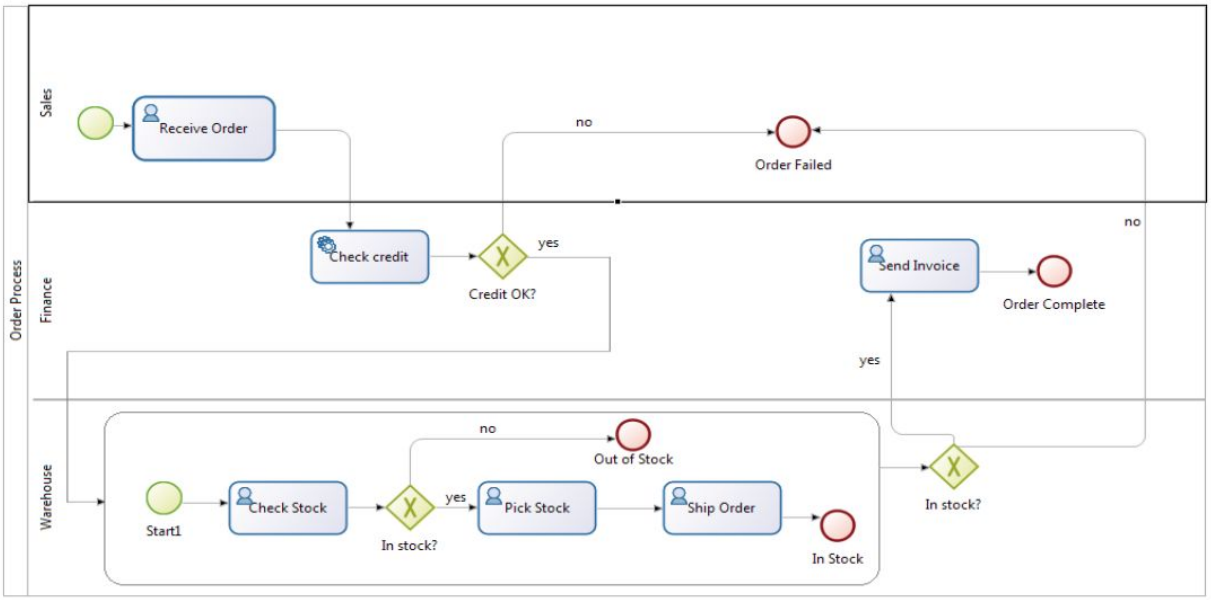
- **Splitting exception paths from the happy path.**



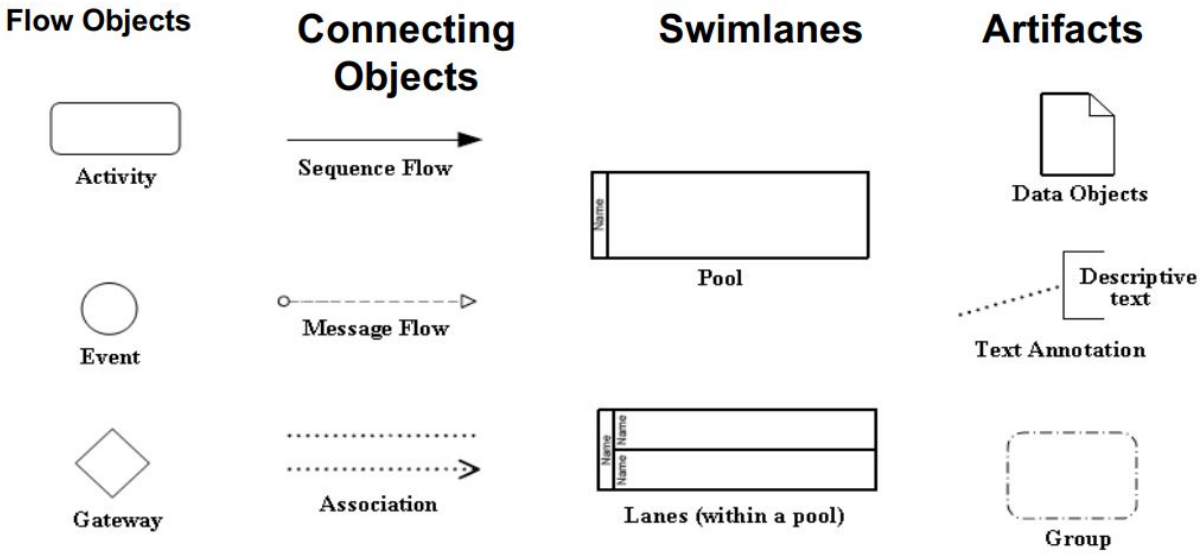
Order Process In Lanes



Order Process Including Expanded Subprocess



Elements

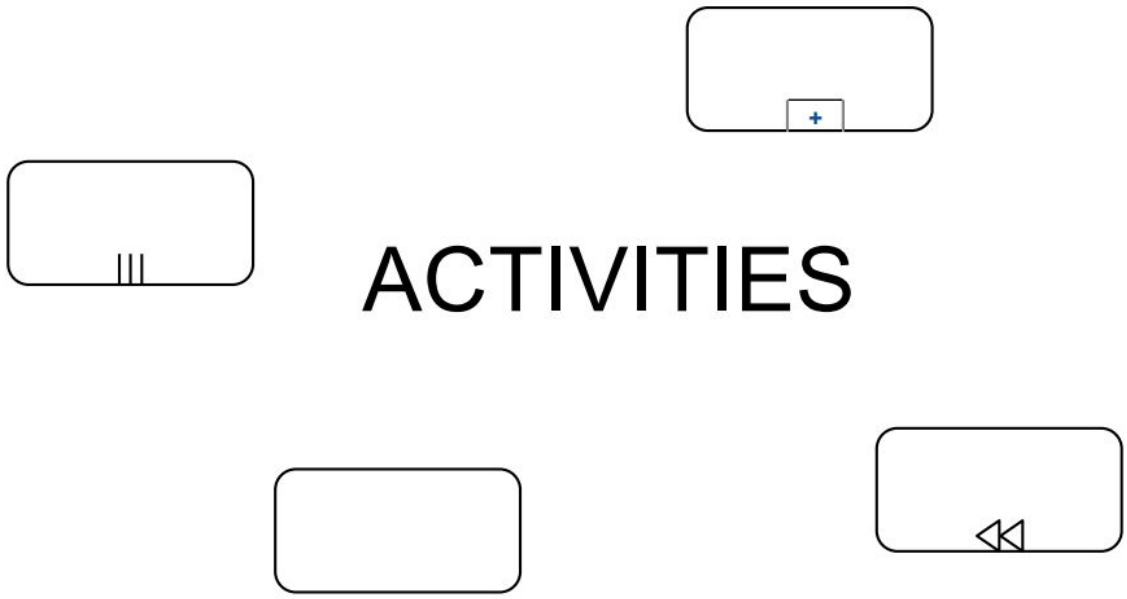


Modelling Palette (method and style)

- Pool and Lane
- User task (manual), Service task (automated)
- Subprocess, collapsed and expanded - decomposition

- Start event (None, Message, Timer)
- End event (None, Message, Terminate)
- Exclusive and Parallel Gateway
- Sequence Flow and Message Flow
- Data Object, Data Store, and Message
- Text Annotation
- Link event pair (off-page connector)

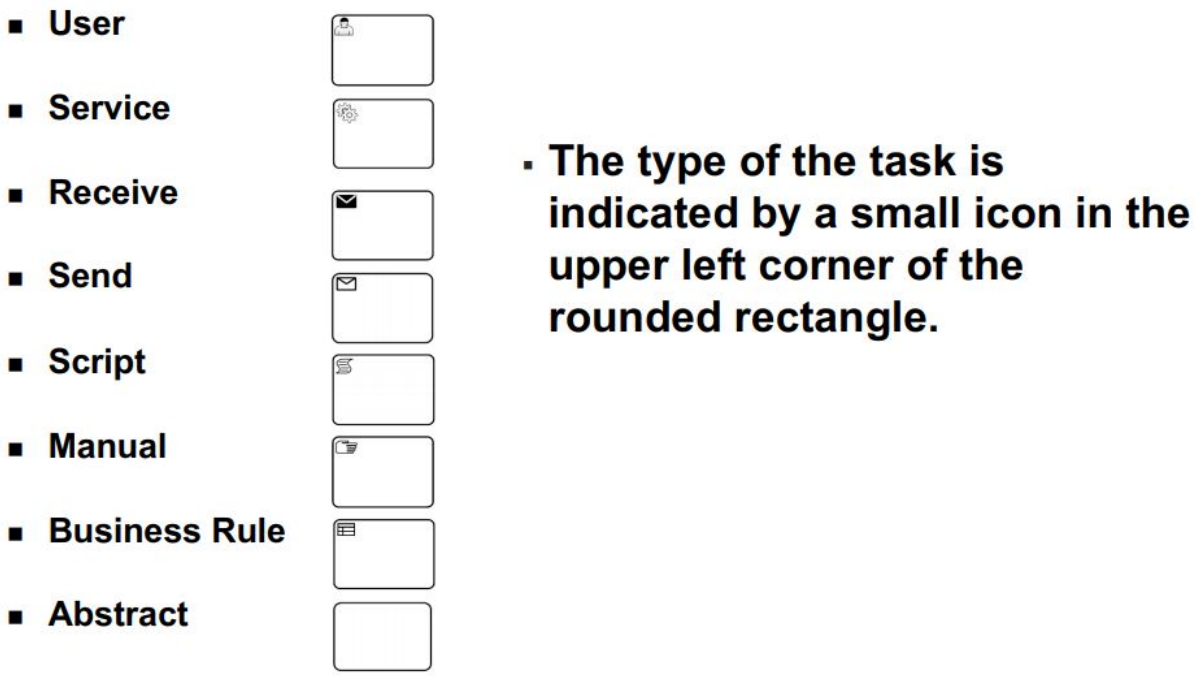
Activities



Activity

- It represents a unit of work performed in the process
- It can be:
    - A task
    - A subprocess
- A task is atomic, i.e. it cannot be further decomposed
- A subprocess i compound, i.e it has subparts defined in the model, which constitute a child process.

Task



The type of the task is indicated by a small icon in the upper left corner of the rounded rectangle.

Subprocess

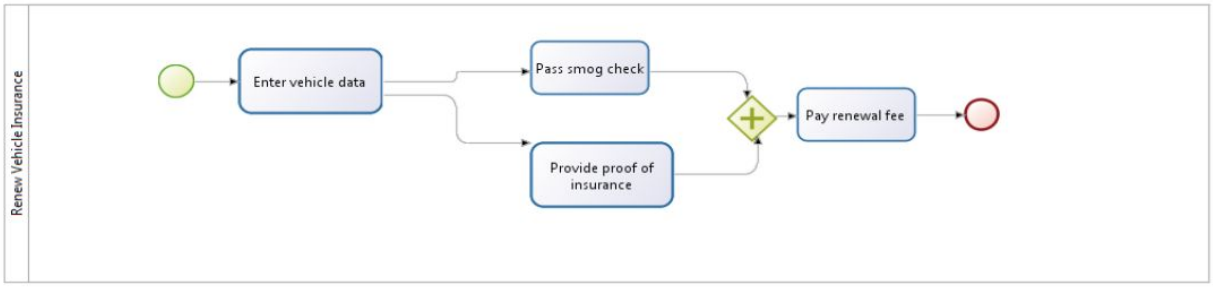
It can be represented as:

- A collapsed subprocess with the child-level explanation draw in a separate hyperlinked diagram.
- Expanded subprocess in the same diagram enclosing the child-level process.

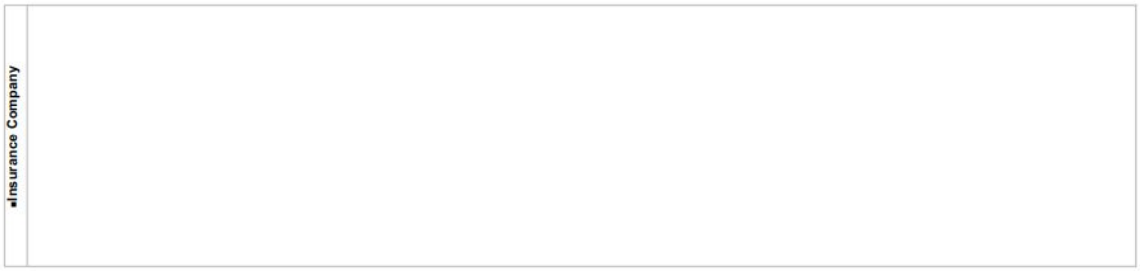
Pools

- A Pool containing flow elements is a process pool or white box pool and is labeled with the name of the process.
- An empty pool or black-box pool represents a business entity or role labeled with names such as customer, seller, etc.

White-box Pool



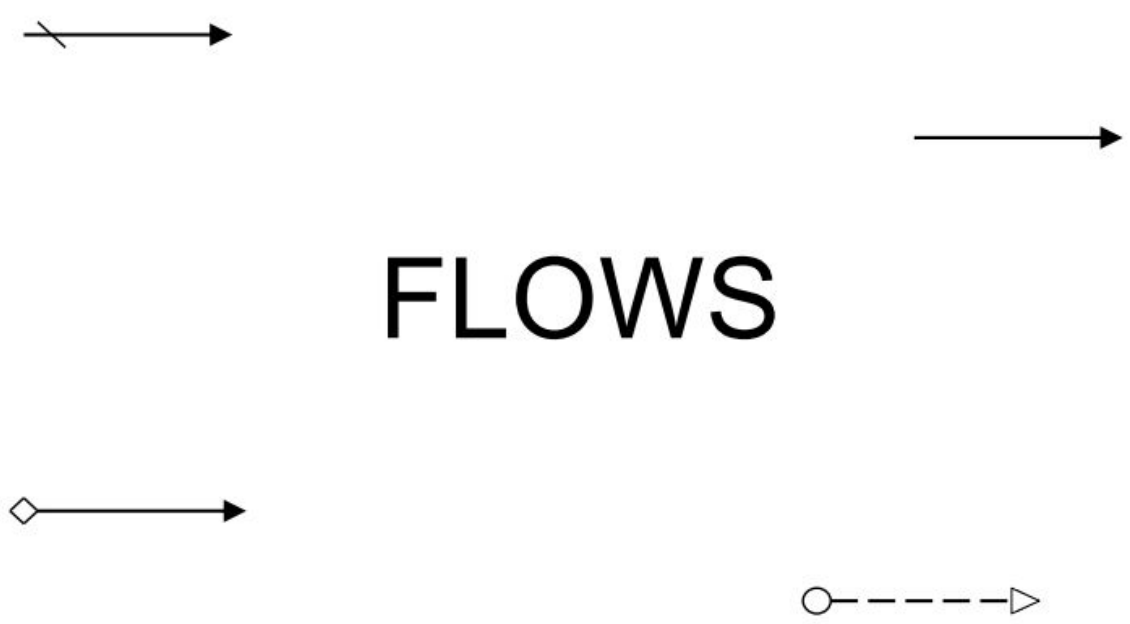
Black-box Pool



Lane

- It is an optional subdivision of a process level
- BPMN allow lanes to be drawn without being enclosed inside a pool. However, some tools do not allow this.
- Lanes are used to group process activities that are executed by particular actors, i.e. departments or roles.
- However, they can be used for any type of categorization, e.g. user vs. automated (service) activities

Flows



It represents the sequential execution of process steps:

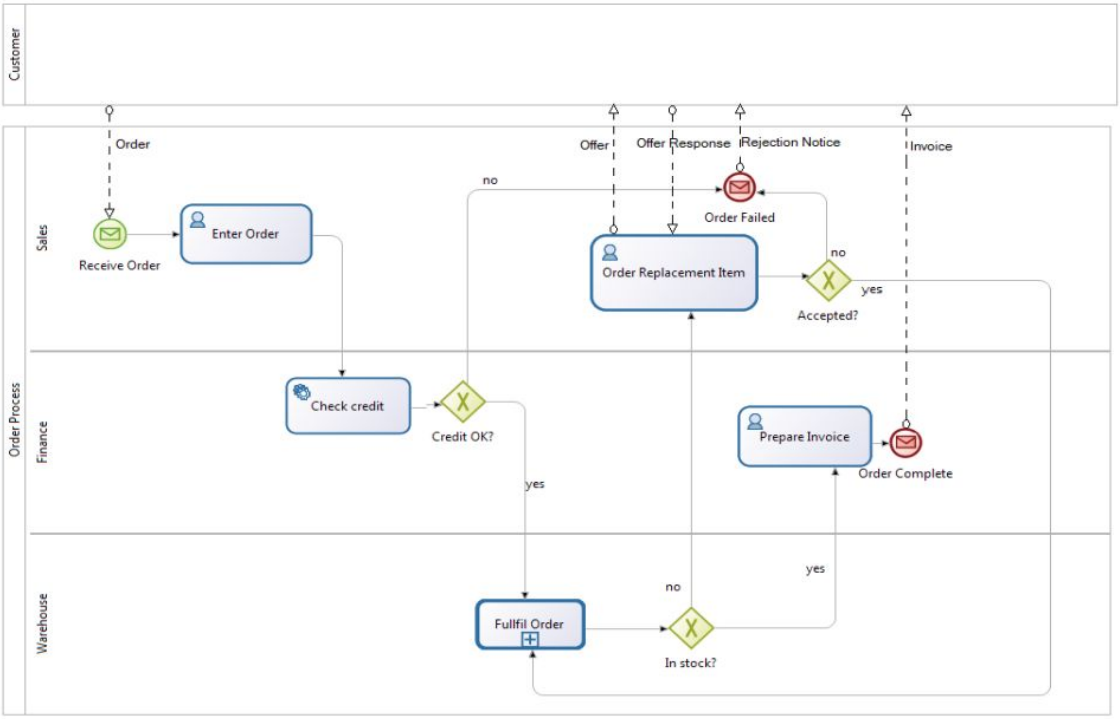
- Conditional flow
- Default flow

It connects only flow objects (i.e. activities, events and gateways)

Message Flow

- It represents communication between the process and an external entity.
- It can connect to any type of activity, a message or multiple event or blackbox pool.
- It cannot be connected to a boundary of a white-box (process) pool. It must be directly connected to an activity or a message inside the pool.
- A message flow, in some cases, indicates the possibility of message communications, not the certainty of it. For example, a user task with an outgoing message task may send the message, not must sent a message.

Sequence and Message Flows: Example



Gateways

Gateway

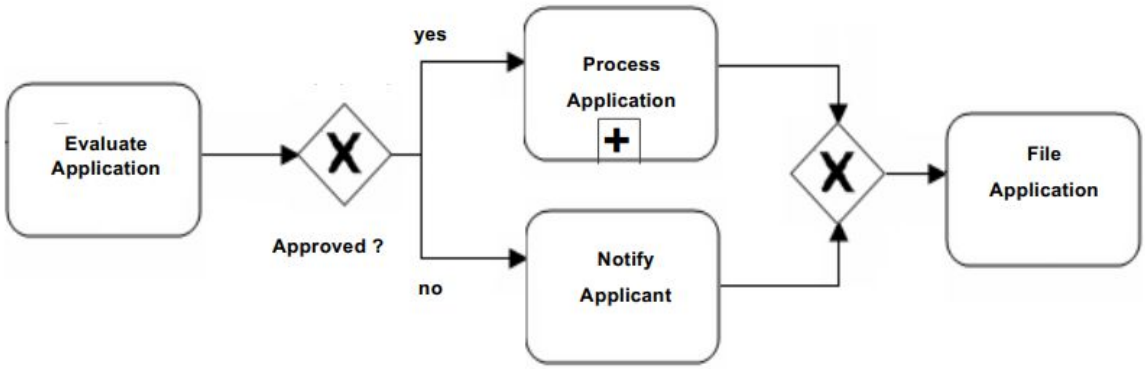
It represents a gate mechanism which either allows or blocks the flow in a business process. Gateways may split one flow into multiple flows or merge discrete flows in one.

Exclusive Data-Based Gateway

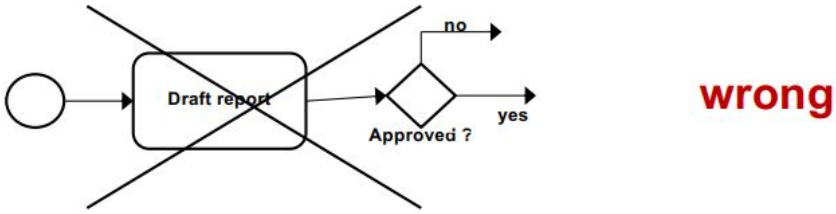
- It is commonly known as XOR gateway.
- “Exclusive” means that only one of its outgoing sequence flows or gates is enabled in any instance.
- “Data-based” means the enabled gate is determined by evaluating an expression of process data.
- The gateway condition is expressed in the process diagram by the labels of the gateway and gates.

split: flow is allowed only through one gate:, i.e. through the gate whose condition is true. At least one of the conditions should be true. The default sequence flow can be used to ensure flow propagation.

join: the flow that arrives first in the gateway is allowed to proceed. The rest are ignored. A join gateway can be omitted and the incoming flows can be directly connected to the subsequent activity.



A getway cannot make decision; it only tests a data condition

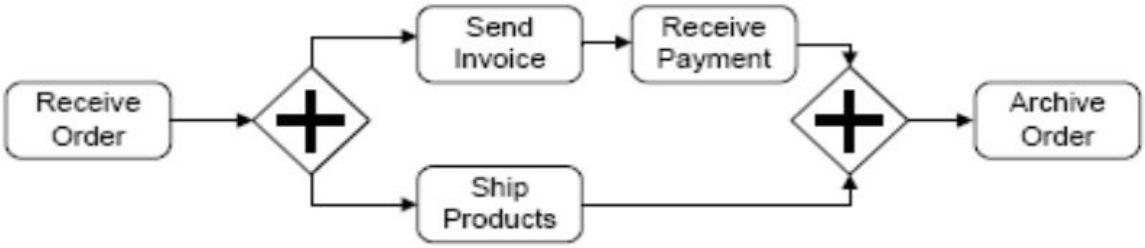


Parallel Gateway

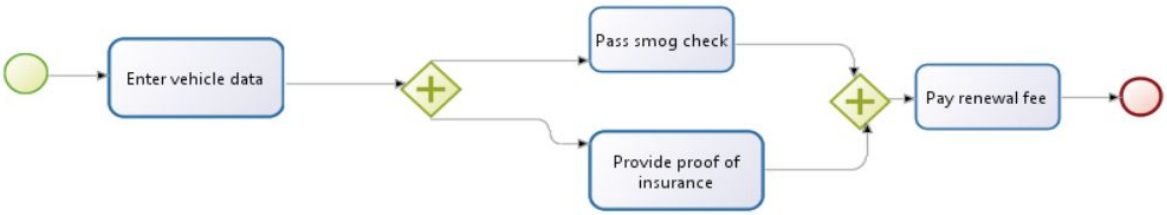
- It is commonly known as AND split.
- All of the outgoing sequence flows are to be followed in parallel, unconditionally.
- Each outgoing path represents a concurrent thread of process activity, meaning they overlap in time.
- Parallel paths may either be joined downstream or lead to separate end events. In the latter case, each parallel path must reach an end event in order for the process to complete.

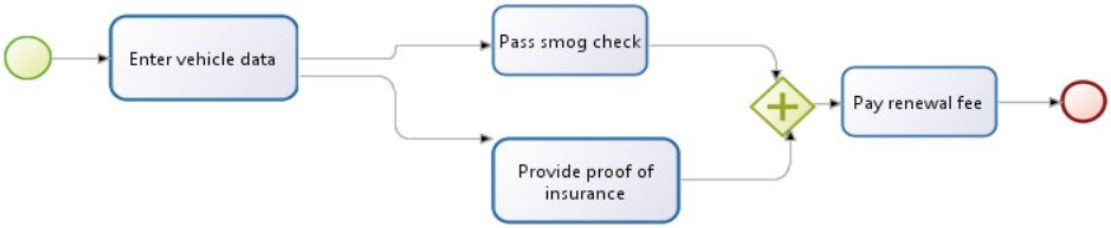
split: parallel flows are created.

join: the gateway waits for all parallel flows to arrive (synchronization). If the join parallel gateway is omitted, the subsequent activities in the process flow will be executed multiple times (as many as the parallel paths). If this is not desired always use a join gateway.

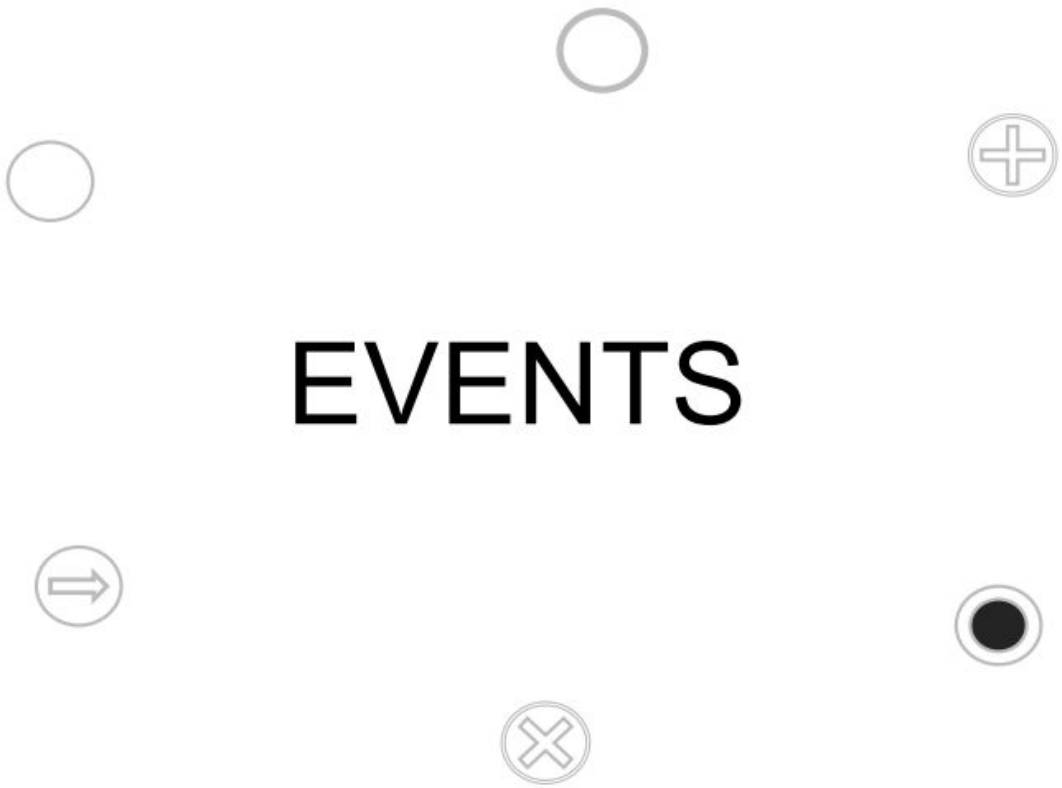


Parallel Gateway: Equivalent Diagrams





Events



- It represents something that happens which affects the business process.
- Events affect the process flow
- An event depending on where it appears within a process model can be a:
    - Start event
    - Intermediate event
    - End event

Start event

- It indicates how a process starts.
- A process may have more than one start events.
- The type of signal instantiating a process is called trigger and is indicated by an icon drawn inside the circle.

End Event

- It indicates the end of a path in a process.
- It is common to see more than one end event in a process.

Intermediate Event

- It occurs after the start of a process and before the end.
- The precise meaning of the intermediate event depends on the details of its presentation:
    - the icon inside
    - the double ring line style
    - its placement in the diagram
- An intermediate event can be:
    - throwing: it has a black icon inside and means that the process generates the trigger signal.
    - catching: it has a white icon inside and means that the process waits for the trigger signal.
- Not all types of intermediate events support both types of behaviour, i.e. throwing and catching.

Event types

- **Empty – placeholder (don't know, yet)**
- **Message – receiving or sending a message**
- **Timer – scheduled event, triggers flow**
- **Rule – condition is met, exception raised**
- **Exception – throw, catch error or generate error**
- **Cancellation – perform cancellation or cancel**
- **Compensation – trigger and perform compensation handling**
- **Multiple – several triggers, only one is needed or several results are required**
- **Termination – kill process**

Data & data Associations

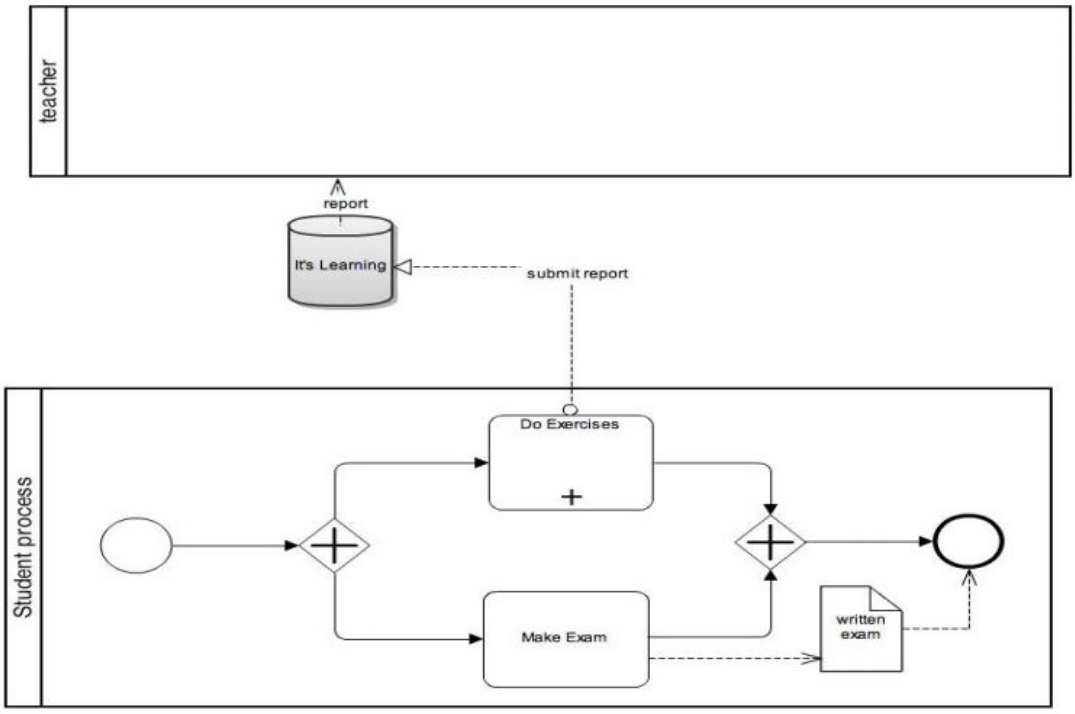
Data Object

- It represents a local variable in a process.
- It is a piece of temporary data stored inside the process instance while it is running.
- Its value is visible to other elements in the same process level or one of its child processes – for example it can be passed to the input of a process activity or be tested by a gateway condition – but it is invisible to a sibling or parent level element.
- When the process ends the data object disappears.
- It works like a variable in a computer program, not what a modeler normally means with “data”.

Data store

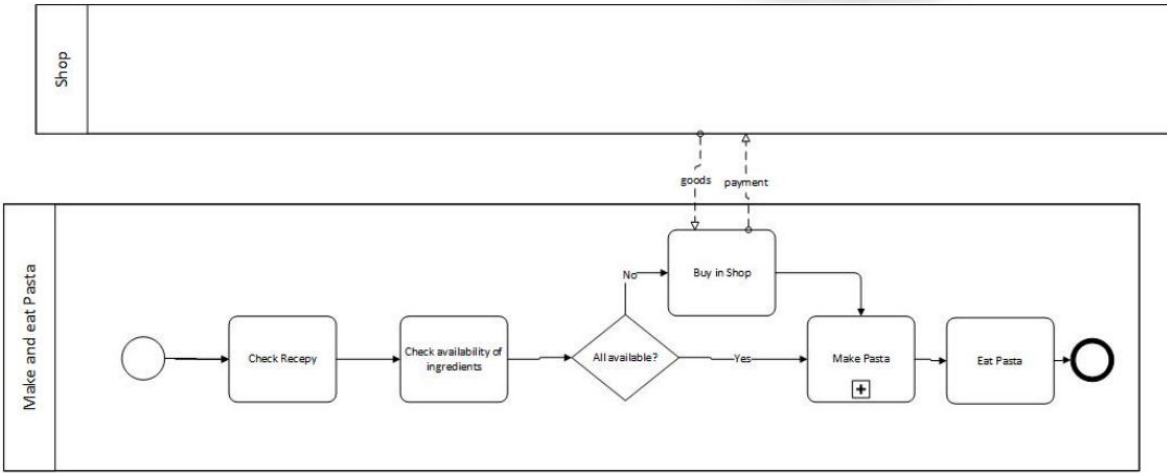
- It represents persistent data, such as information stored in a database or business system.
- It does not disappear when the process ends.
- It is more often what a process modeler means by “data”.

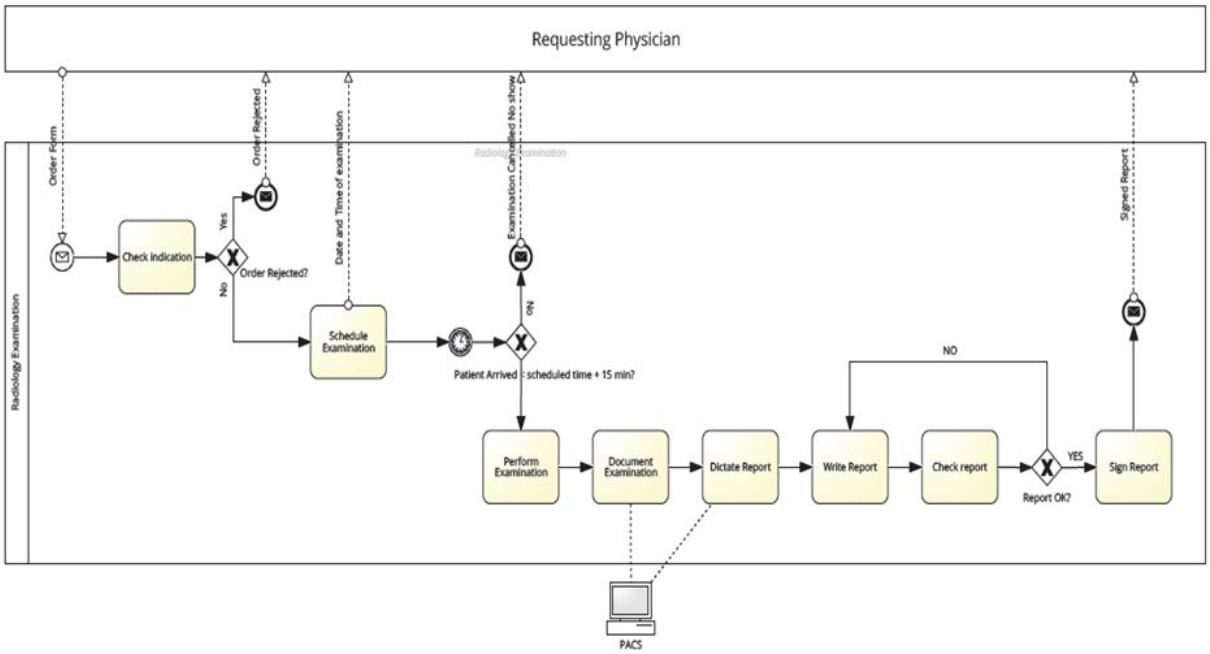
Data Object and Data Store

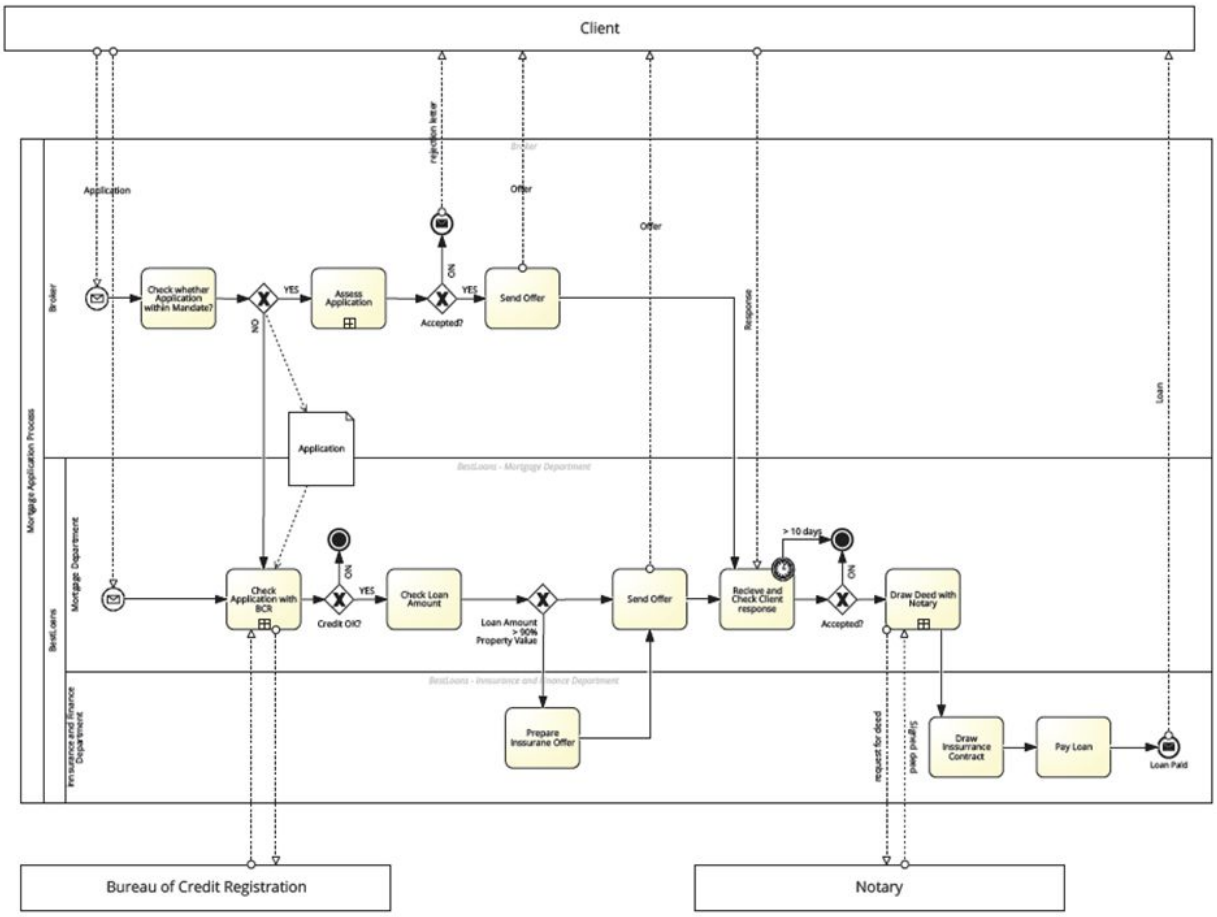


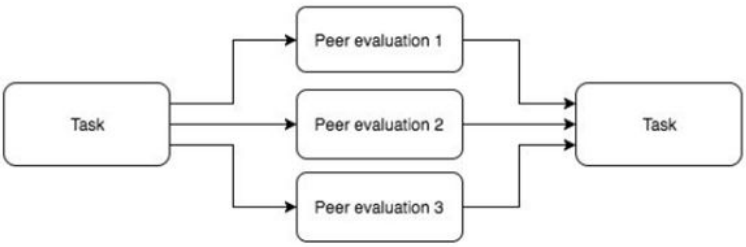
10 minute task

- **Make a BPMN-model that shows the process for making and having pasta dinner**

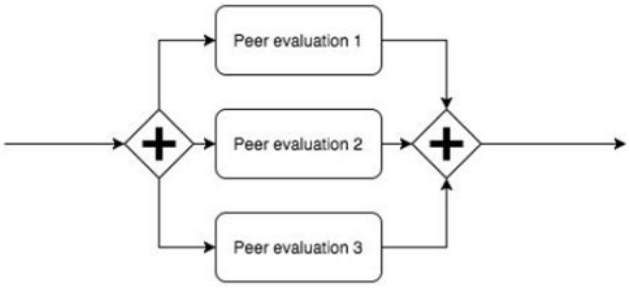


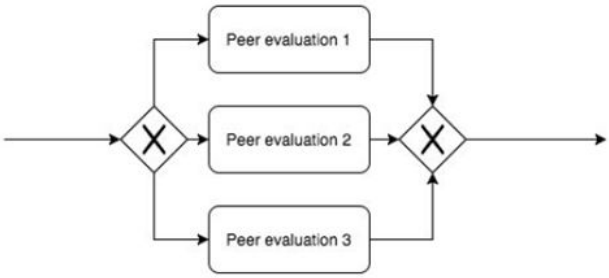

Requesting Physician
Radiology Examination
Order Form
Order Rejected
Date and Time of examination
Examination Cancelled No show
Signed Report
Check indication
Yes
No
Order Rejected?
Schedule Examination
ON
Patient Arrived - scheduled time + 15 min?
NO
Perform Examination
Document Examination
Dictate Report
Write Report
Check report
YES
Report OK?
Sign Report
PACS


Client
Mortgage Application Process
Broker
BestLoans
Mortgage Department
Insurance and Finance Department
Application
rejection letter
Offer
Response
Loan
Check whether Application within Mandate?
YES
NO
Assess Application
ON
Accepted?
Send Offer
Application
Check Application with BCR
Credit OK?
Check Loan Amount
Loan Amount > 90% Property Value
Send Offer
> 10 days
Recieve and Check Client response
Draw Deed with Notary
Prepare Insurane Offer
request for deed
signed deed
Draw Insurrance Contract
Pay Loan
Loan Paid
Bureau of Credit Registration
Notary

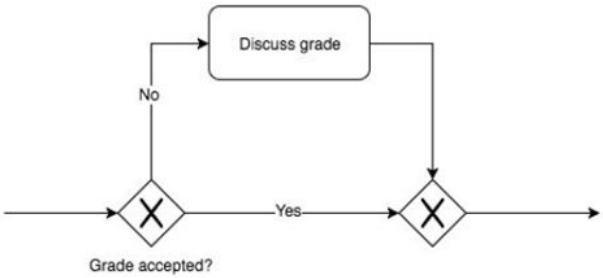


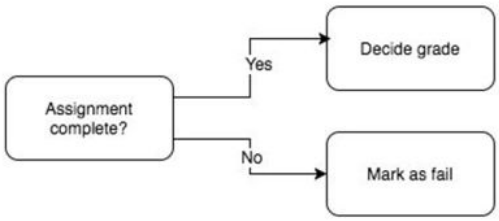
Several tasks going into the same task should be merged





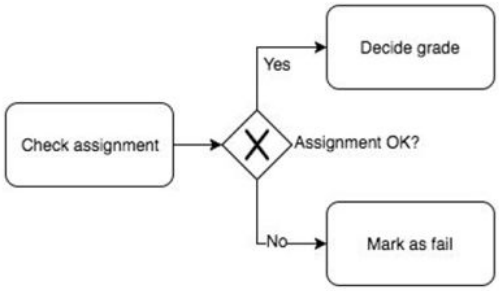
The peer evaluations are paralell tasks., and should not be XOR

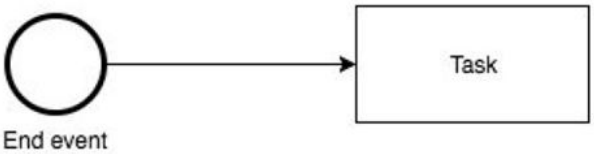




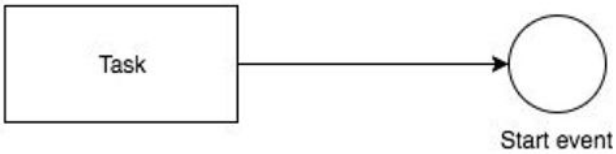
Tasks: It cannot choose between yes or no (Tasks represents a unit of work performed in the process)

Gateways: Cannot make decisions; it only tests a data condition.

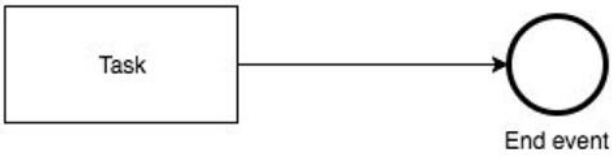


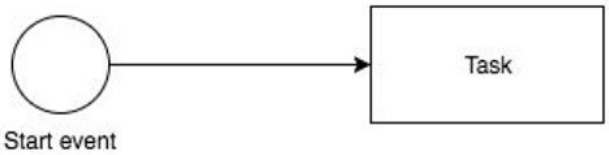


Sequence flow should not go from end events

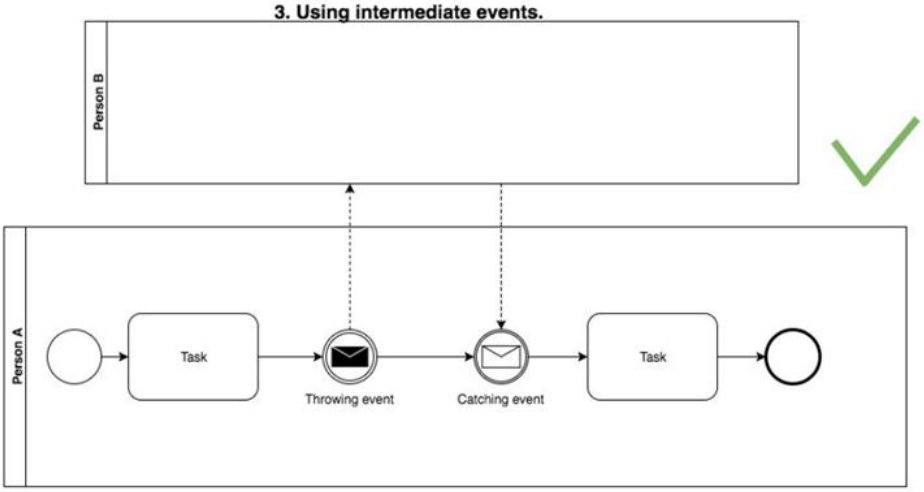


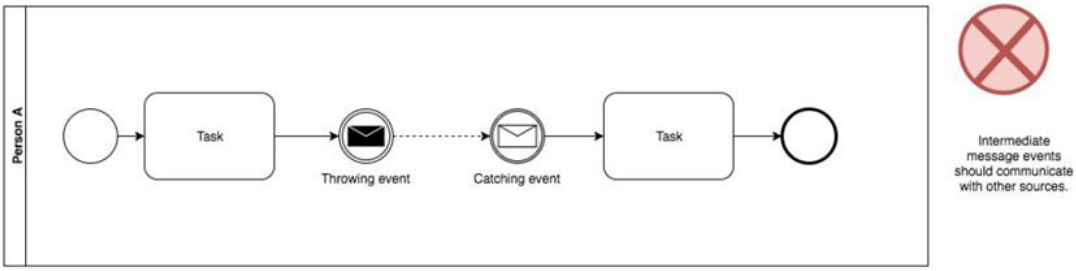
Sequence flow should not go to start events



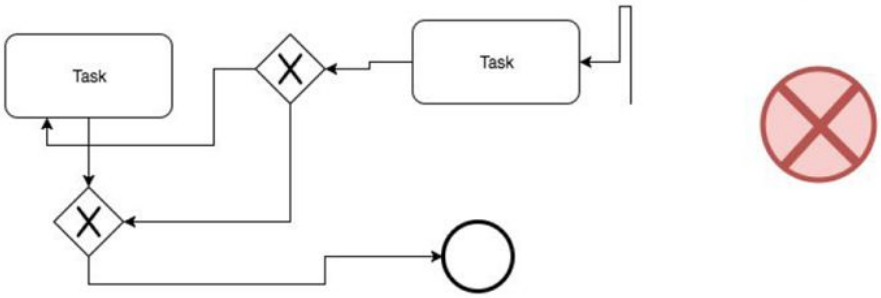


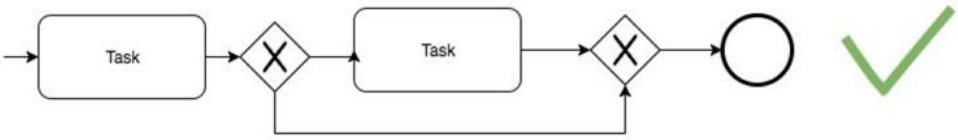
3. Using intermediate events.

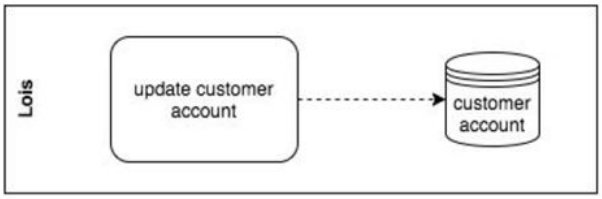




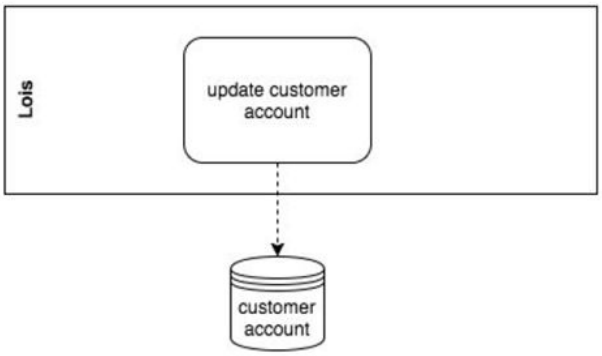
No lines crossing each other, layout: left to right. It should not go in circles, and it should be easy to read and understand the model. Avoid making the user follow a complicated route through your model. The lines should be straight.







Don't put databases inside pools/lanes



[06] Information Systems Methodology and Enterprise Architecture

IS Methodology

- Ensure economic gain
- Ensure personal gain
- Ensure organisational (business) gain
- Ensure societal gain

Phases of value achievement:

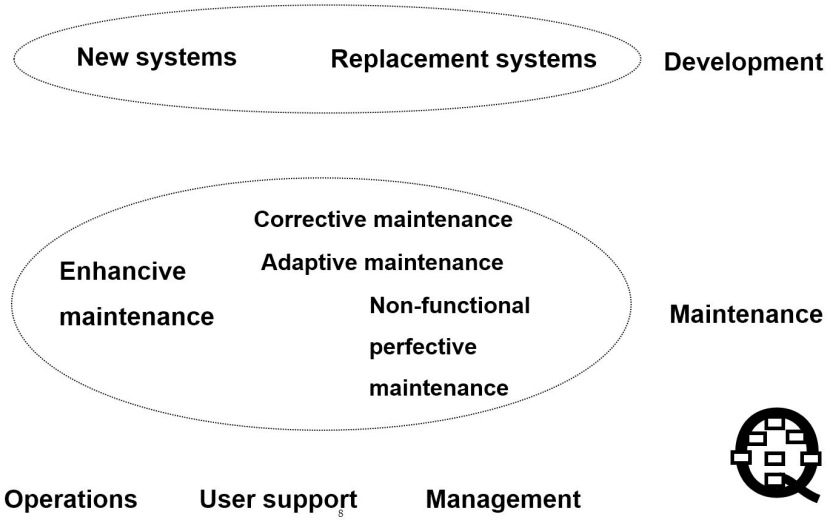
- Plan for value achievement. Business case and value realisation plan
- Perform change
- Implement change and realize the value

Coverage in process

- 1.Development of application systems
- 2.Use of application systems in production
- 3.Operation of application systems in production
- 4.Maintenance and evolution of application systems in production

- Traditional software engineering and information systems methodologies deal primarily with the first, having a short-term perspective
- Enterprise Architecture have a long-term perspective

Tasks within development and maintenance of information systems



Coverage in product

- One single application system
- A family of application systems
- The whole portfolio of application systems in an organisation
- The whole organisation (developing and maintaining an enterprise architecture)
- A cluster of cooperating and partly competing organisations in combined digital ecosystems.

Why look on whole application systems portfolio?

- Different applications are highly integrated. 73% of applications depend on data produced by other systems.
- Medium and large organizations have many hundreds of applications.
- More than half of 'new systems' are replacement systems
- Most important reasons for replacement both in 2008, 2013, and 2018 investigations, are needed for integration with other systems.

Capabilities

Skills needed for ....:

Application portfolio Evolution

- Skills needed on personal and organizational level
- **E.g roles in Scrum**
    - Product owner

    - Scrum master
    - Team
- **E.g roles in Rational Unified Process**
    - Business analyst
    - System analyst
    - Software architect
    - Integrator
    - Test manager
    - Test analyst
    - Test Designer
    - Deployment manager
    - Project manager
    - Process engineer
    - Configuration manager
    - Change control manager

Enterprise Architecture

Competences related to modelling:

- ability to model
- ability to facilitate a modelling session
- Competences related to managing enterprise modelling projects
- ability to select an appropriate EM approach and tailor it in order to fit the situation at hand.
- ability to interview involved domain experts
- ability to define a relevant problem.
- ability to define requirements on the results
- ability to establish a modelling project
- ability to adjust a presentation of project results
- ability to navigate between the wishes of various stakeholders
- ability to assess the impact of the modelling result and the modelling process

Stakeholder participation

Stakeholders in systems development

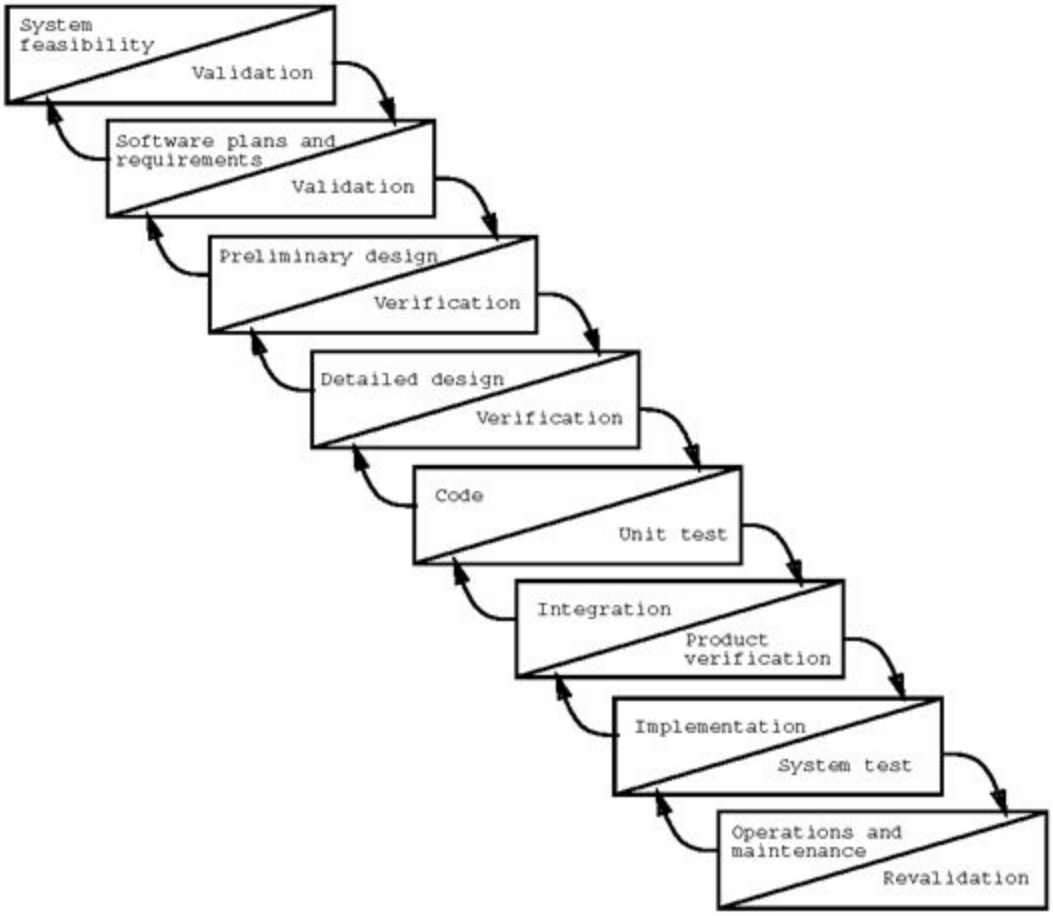
- Those who are responsible for its design, development, introduction and maintenance, for example, the project manager, system developers, communications experts, technical authors, training and user support staff, and their managers.
- Those with financial interest, responsible for the application systems sale or purchase. These are typically termed the 'customer' of the system.
- Those who have an interest in its use, for example direct or indirect users and user's managers. Direct users are often called end-users.

- Those affected by long-term effects of the system
- Direct or indirect participation
- Selected or elected participants
- Level of participation

Level of participation

-1. Manipulation by giving wrong or biased information
0. No information to stakeholders
1. Information to stakeholders provided
2. Consultation with stakeholders (e.g. hearings)
3. Advice of stakeholders taken into account
4. Common decision between stakeholders (problem owners) and developers
5. Delegated authority to stakeholders
6. The problem-owners have full control

Waterfall method



Systems developed using the conventional methodology is often difficult to change, resulting in poor support for system evolution.

Alternatives to waterfall-model

- Prototyping (Rapid or evolutionary)
- Incremental development
- Transformational development
- Operational development
- RUP

Agile methods

Agile Manifesto (2001)

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

Combining short and long term development

- Gartner: Bimodal IT: Is the practice of managing two separate, coherent modes of IT delivery, one focused on stability and the other on agility.
- Mode 1 is traditional and sequential, emphasizing safety and accuracy.
- Mode 2 is exploratory and nonlinear, emphasizing agility and speed

	Mode 1	Mode 2
Goal	Reliability	Agility
Value	Price for performance	Revenue, brand, customer experience
Approach	Waterfall, V-model, "high-ceremony IID"	Agile, Kanban, "low-ceremony IID"
Governance	Plan-driven, approval-based	Empirical, continuous, process-based
Sourcing	Enterprise suppliers, long-term deals	Small, new vendors; short-term deals
Talent	Good for conventional processes and projects	Good for new and uncertain projects
Culture	IT-centric, removed from customer	Business-centric, close to customer
Cycle times	Long (months)	Short (days, weeks)

Gartner

Why we need the 'slow', long term?

- An overall software architecture supporting safe, reliable and secure systems
- Developing IT-solutions to support sustainable development
    - Dimensions of sustainability:
        - Environmental
        - Economic
        - Social
        - Individual
        - *Technical*

Task	Standard current practice	Focus of future practice
Mind-setting	The world is a puzzle, and we should solve the problem.	The world is complex, and we should first understand the dilemmas.
Determination of the project objective and the system purpose, boundary, and scope	Focus on the immediate business need and key system features. Don't question the project's or system's purpose.	Emphasize how the project can affect sustainability in all dimensions. Strive to advance sustainability in multiple dimensions simultaneously. Experiment with different system boundaries to understand the alternative impacts.
External constraint identification	See constraints as imposed by the direct environment of the system and its technical interfaces. Minimize the constraints considered, but include legal, safety, security, technical, and business resources.	See constraints in each dimension as opportunities. Look for constraints from additional sources, starting with company corporate-social-responsibility policies, legislation, and sustainability standards.
Stakeholder identification	Minimize the number of stakeholders involved, and focus on those who have influence. Focus on internal stakeholders, and exclude unreachable stakeholders.	Maximize stakeholder involvement in an inclusive perspective integrating external stakeholders, and involve those who are affected. Assign a dedicated role to be responsible for sustainability, and introduce surrogate stakeholders to represent outside interests.
Success criteria definition	Focus on the financial bottom line at project completion. Measure the business outcome and financial return on investment.	Focus on advancing multiple dimensions simultaneously, including financial aspects, and take into account that most effects occur after project completion.
Requirements elicitation	Focus on the features and immediate effects the stakeholders want.	Help the stakeholders understand the system's enabling effects. Use creativity techniques and long-term scenarios to forecast the potential structural impact.
Risk identification	Identify risks that threaten timely project completion within the budget.	Include the effects on the system's wider environment. Include enabling and structural effects and risks that can develop over time.
Tradeoff analysis	View tradeoff analysis as a prioritization and selection problem, and let the key stakeholders decide.	Strive to transform sustainability tradeoffs into mutually beneficial situations. Ensure that a wider range of stakeholders (or their surrogates) discuss sustainability tradeoffs.
Go/no-go decision	Base the decision on feasibility, financial costs and benefits, and risk exposure to project participants—that is, internal stakeholders.	This continues to be an internal business decision but is documented to show to external audiences that it took into account sustainability indicators and enabling effects. The decision is based on a consideration of positive and negative effects in all five dimensions.
Requirements validation	Let key stakeholders verify that their interests are captured.	Ensure broad community involvement focused on understanding effects.
Project completion	Verify whether success criteria are met on the completion date. After that, focus on maintenance and evolution.	Evaluate the effects in all five dimensions over a certain time frame after completion, aligned with the expected timescale of effects.
Requirements documentation	Current templates ignore long-term effects and sustainability considerations.	Templates require information about sustainability as a design concern and support analysts with checklists.

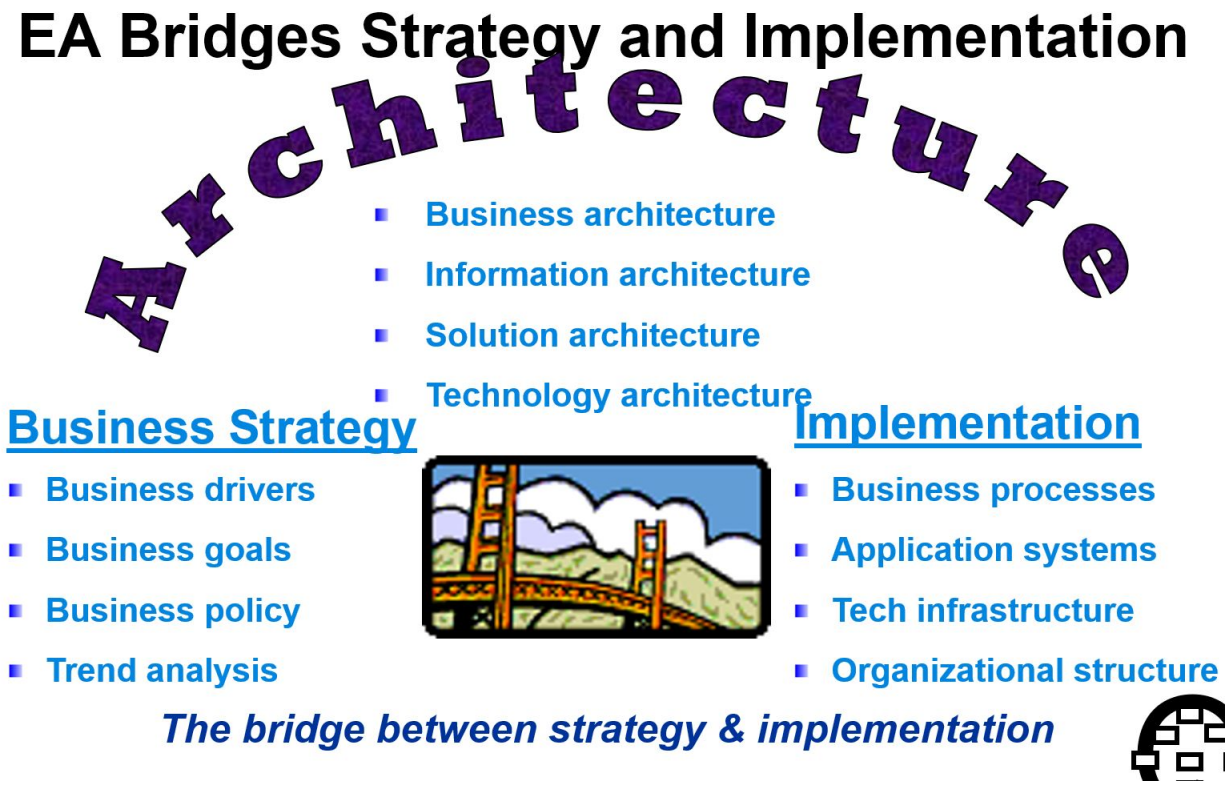
DevOps

- DevOps is the practice of operations and development engineers participating together in the entire service lifecycle, from design through the development process to production support.
- Integrated development and operations
- Supporting quick releases

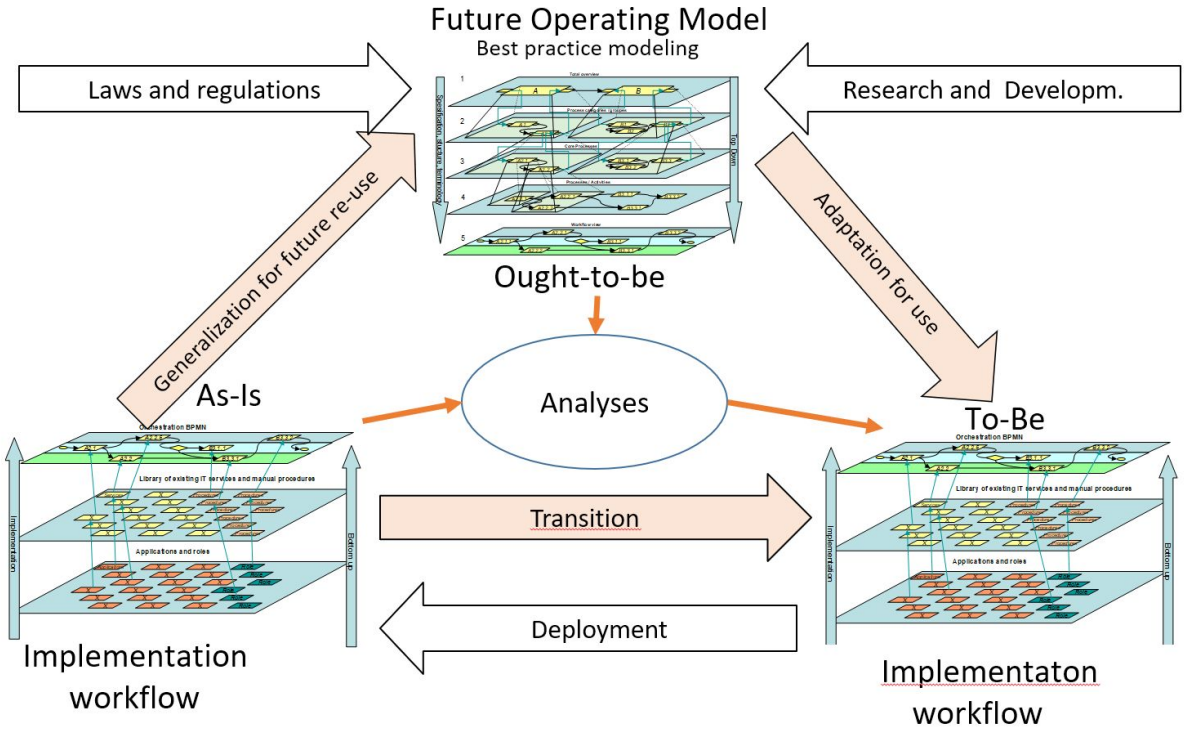
Enterprise Architecture (EA)

Why EA?

- Twenty-five years ago, a new field was established that soon came to be known as enterprise architecture. The field initially began to address two problems:
    - System complexity—Organizations were spending more and more money building IT systems; and
    - Poor business alignment—Organizations were finding it more and more difficult to keep those increasingly expensive IT systems aligned with business need.
- The bottom line: more cost, less value.



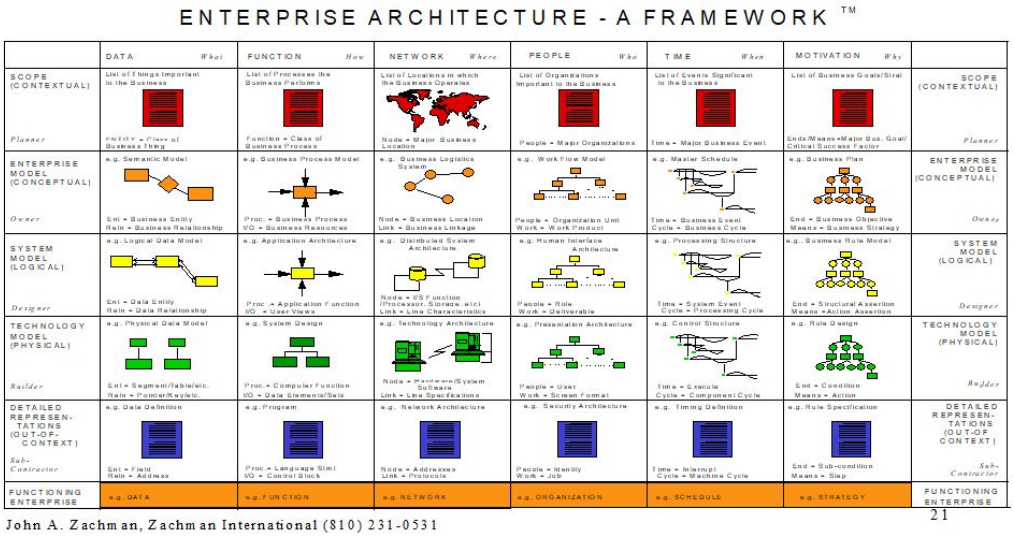
As-Is, Ought-to-be and & To-Be



Why do organizations need an EA?

- The purpose of enterprise architecture is to optimise across the enterprise the often fragmented legacy of processes
- Thus the primary reason for developing an EA is to get an overview (map) of the business' processes, systems, technology, structures and capabilities.
- The organization need an EA to provide a strategic context for the evolution of the IT system in response to the constantly changing needs of the business environment.

Zachman's Framework



- The Zachman Framework is a taxonomy for ways of describing the Enterprise.
- A logical structure for classifying and organizing the descriptive representation of an Enterprise.
- Neutral with regard to the processes or tools used for producing the description.

Description

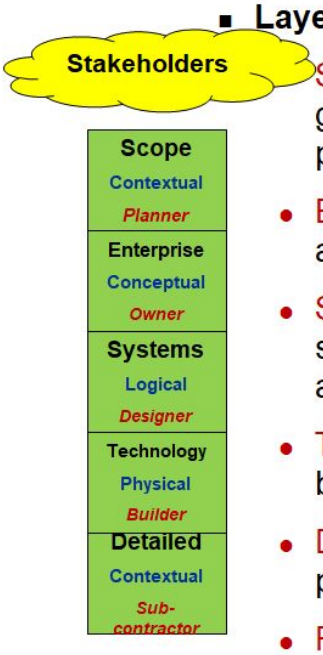
- 2 dimensions:
  - "Players in the game" abstraction levels - Viewpoints
  - Aspects/perspectives of an enterprise

Both these are dimensions are critical for obtaining a holistic understanding of the enterprise.

Data	Function	Network	People	Time	Motivation
What	How	Where	Who	When	Why

- **Aspects:**
  - Data (what) – data needed for the enterprise to operate.
  - Function (how) – concerned with the operation of the enterprise.
  - Network (where) - concerned with the geographical distribution of the enterprise's activities.
  - People (who) - concerned with the people who do the work, allocation of work and the people-to-people relationships.
  - Time (when) – to design the event-to-event relationships that establish the performance criteria.
  - Motivation (why) – the descriptive representations that depict the motivation of the enterprise. It will typically focus on the objectives and goals.

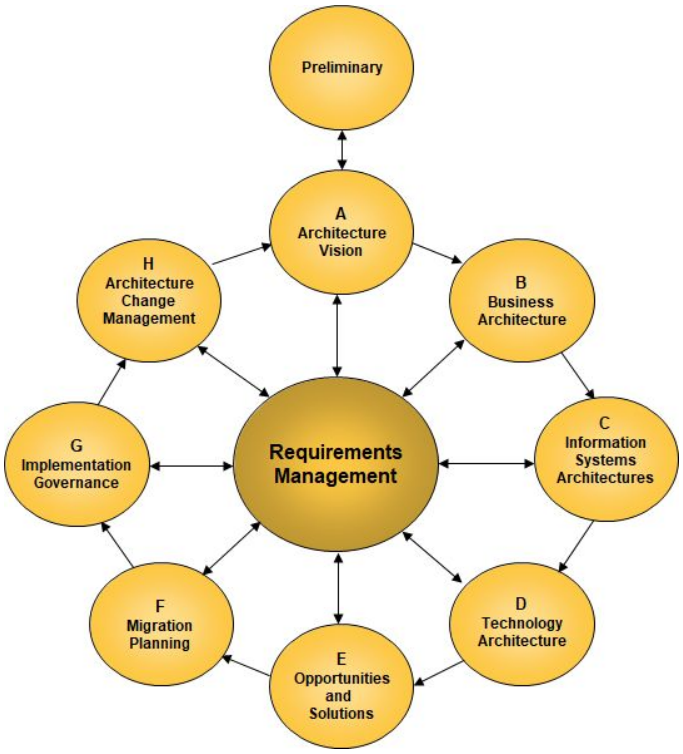
- **Layers or views (players):**



Scope: a "bubble chart" or Venn diagram, which depicts in gross terms the size, shape, partial relationships, and basic purpose of the final structure.

- Enterprise or business model: the design of the business or the architect's drawing.
- System model: translations of the drawings into detailed specifications. Corresponds to a systems model by a systems analyst.
- Technology model: the architect's model translated to a builder's model.
- Detailed representations: detailed specifications given to programmers.
- Functional enterprise: a system is implemented and made a part of the enterprise.

TOGAF



Benefits

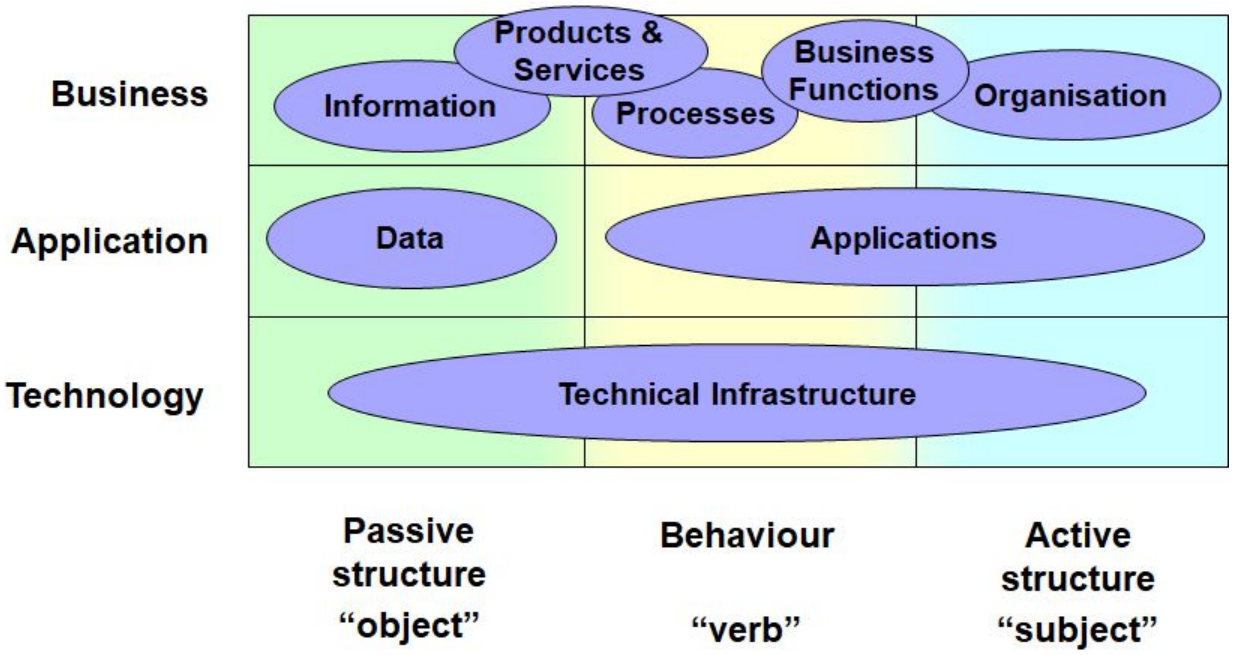
- +TOGAF is flexible about the architecture that is generated – ”architecture agnostic” or vendor neutral.
- +Comprehensive process, from business requirements to applications to infrastructure.
- The final architecture may be good, bad or indifferent.
- ÷TOGAF merely describes how to generate enterprise architecture, not necessarily how to generate a good one!
- ÷To a large extend top-down, what about bottom-up ?

Property	Rules of the Old Game	Rules of the New Game
Nondeterministic	Enterprise architects applied centralized decision making to design outcomes.	Enterprise architects must decentralize decision making to enable innovation.
Autonomous Actors	Enterprise architects controlled all aspects of the architecture.	Enterprise architects must recognize the broader business ecosystem and devolve control to constituents.
Rule-Bound Actors	Enterprise architects provided detailed design specifications for all aspects of the EA.	Enterprise architects must define a minimal set of rules and enable choice.
Goal-Oriented Actors	The only goals that matter are the corporate goals.	Constituents act in their own best interests.
Local Influences	Communication is centralized; local influences are minimized.	Communication occurs in a peer-to-peer fashion across the business ecosystem.
Dynamic or Adaptive Systems	Innovation is centralized; the rate of change is slow.	Innovation is decentralized, and change is dynamic.
Resource-Constrained Environments	Resources are constrained by the boundaries of the organization.	Resources are constrained by the boundaries of the business ecosystem.

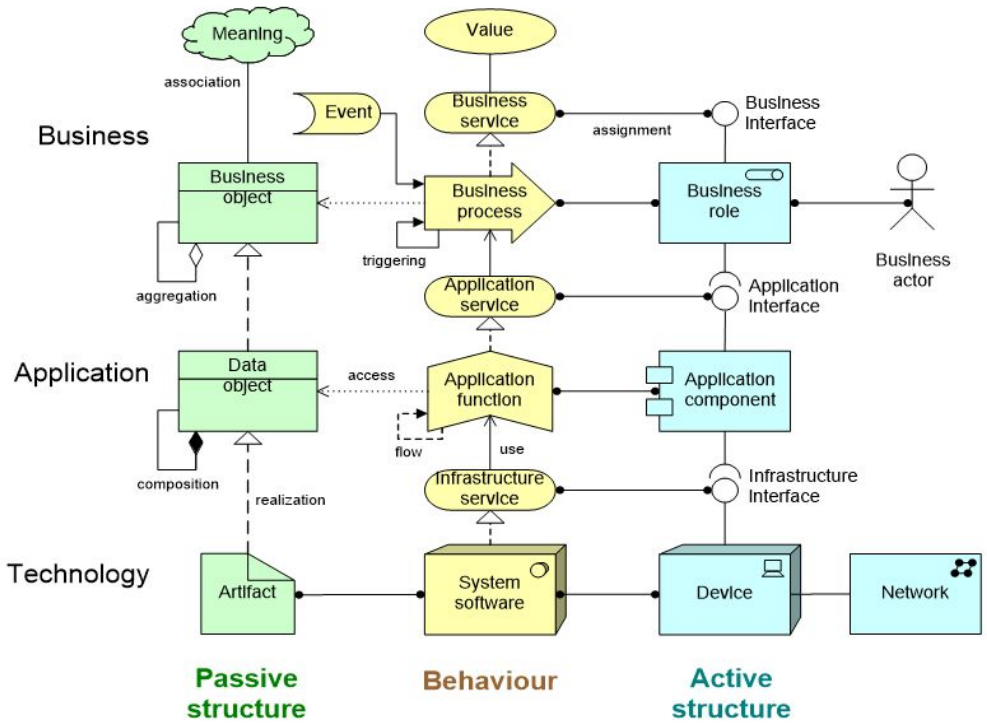
Gartner

Main benefits of ArchiMate

- Lean and mean language:
- just enough concepts, not bloated to include everything possible
- Well-founded concepts & models give precision
- clear communication about architectures
- get away from the ‘fuzzy pictures’ image
- Links to existing approaches
- UML, BPMN, TOGAF
- International vendor-independent standard
- The Open Group
- Tool support
- several tools available



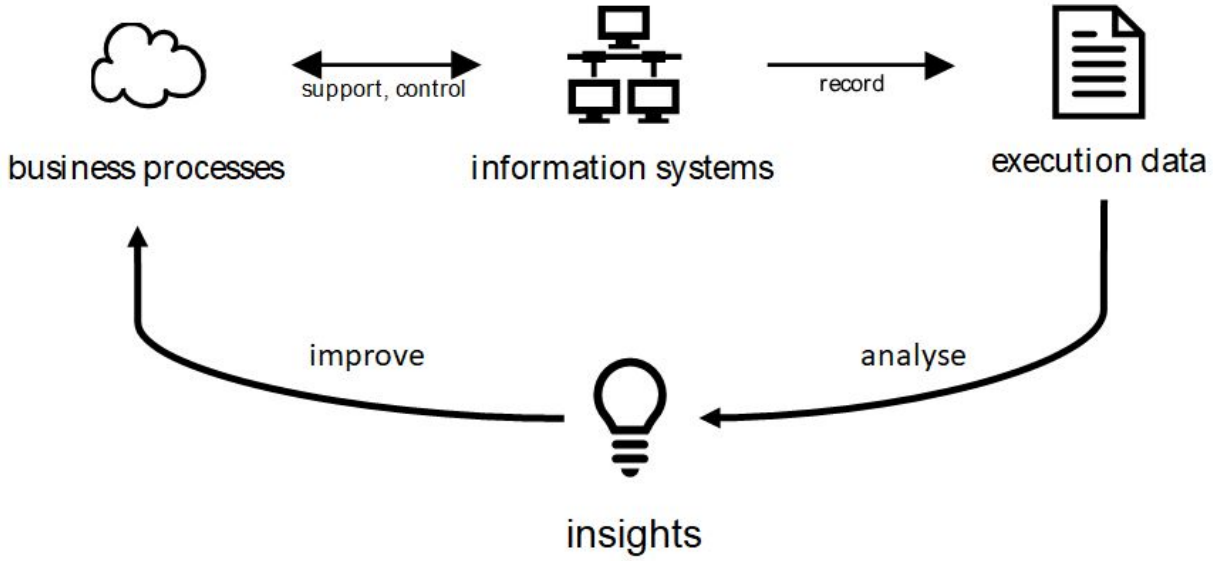
Overview of Core Concepts



- oor business alignment—Organizations were finding it more and more difficult to keep those increasingly expensive IT systems aligned with business need.

- The bottom line: more cost, less value.

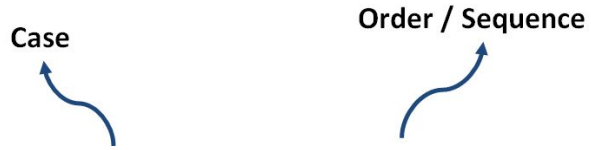
[07] Process Mining



Process mining is an analytical discipline for discovering, monitoring, and improving real processes (i.e., not assumed processes) by extracting knowledge from event logs readily available in today's information systems. Process mining offers objective, fact-based insights, derived from actual event logs, that help you audit, analyze, and improve your existing business processes by answering both compliance-related and performance-related questions.

In business process reengineering, organizations are primarily interested in an improved "to be" process [..] [but] understanding the current process is critical to knowing whether it is worth investing in improvements, where performance problems exist, and how much variation there is in the process across the organization.
[..] companies tend to either skip current process analysis altogether, adopt shortcuts to it, or pay consultants a lot of money to analyze the "as is" process.

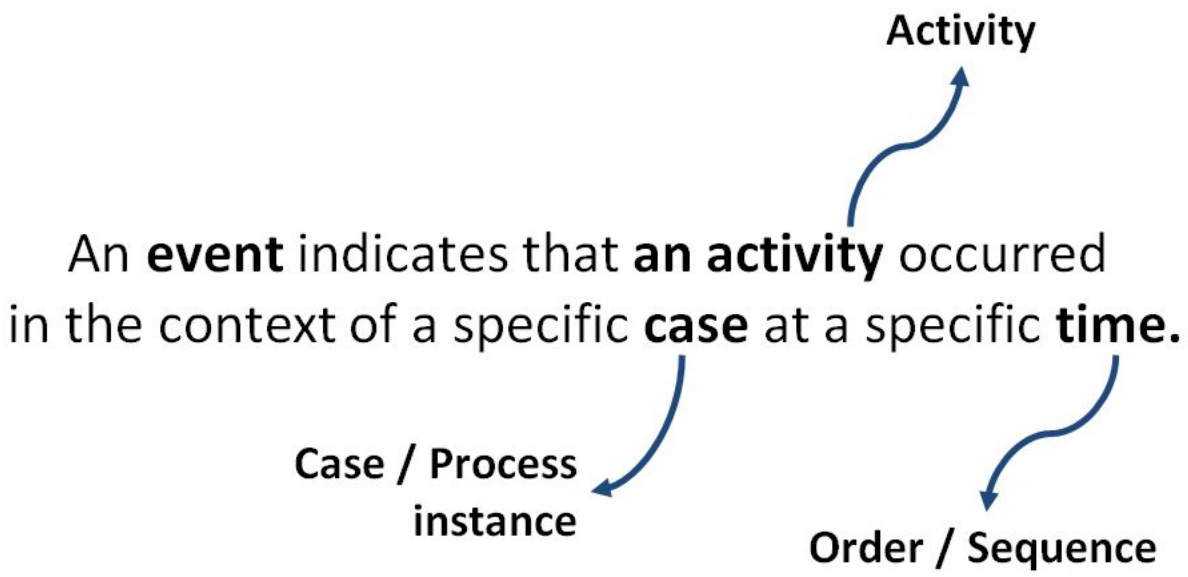
What is a Process?



A process is a set of interrelated or interacting activities which transform inputs to outputs.

What is Process Execution Data?
Input data that is transformed to output data by executing a process. (?)

Event



Two main types of Process Mining:

- Discovery
- Conformance

Process Discovery

- Fitness: “able to replay event log”
- Simplicity: “Occam’s razor”
- Precision: “not underfitting the log”
- Generalization: “not overfitting the log”

- Challenges:
    - Parallelism
    - Infrequent behaviour