Análise de Sistemas de Informação
(UFCD 0781)

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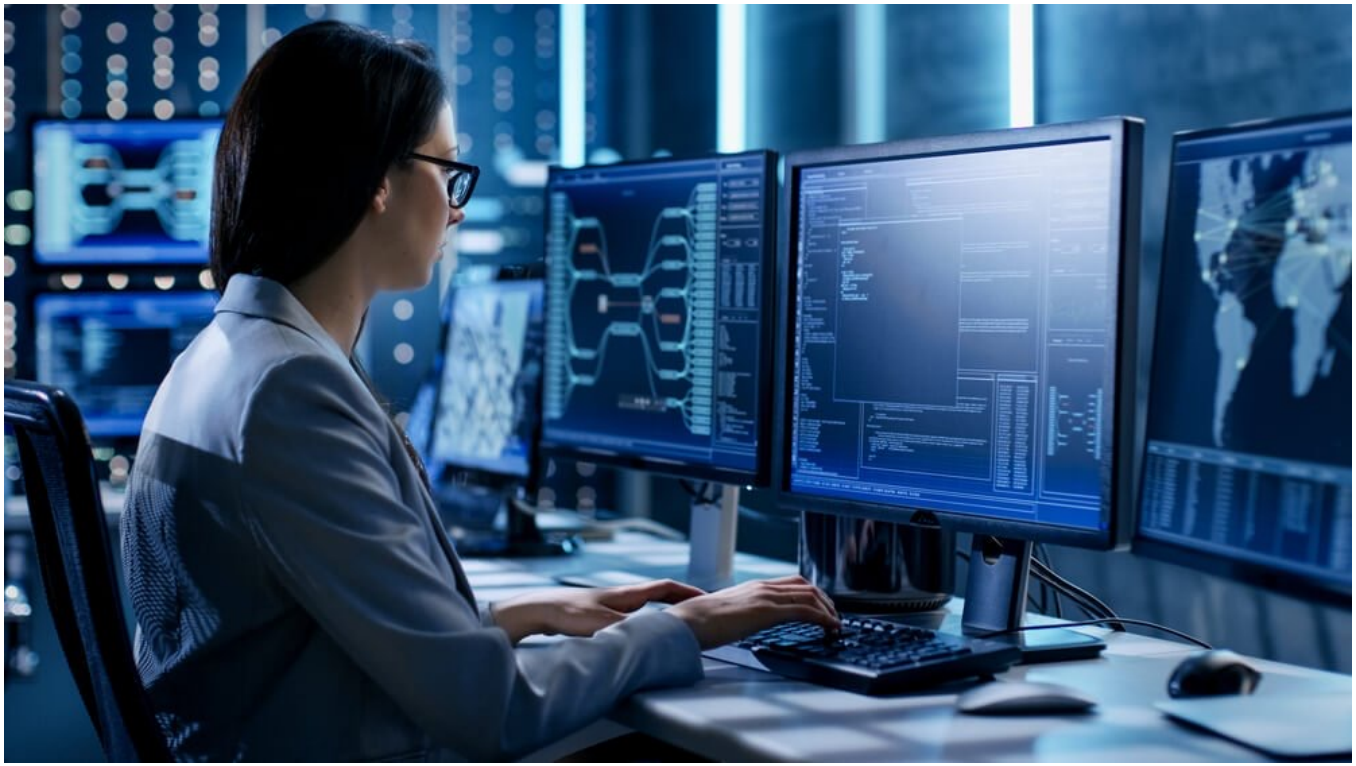
Apresentação do Módulo

OBJETIVO

Reconhecer e utilizar as diferentes metodologias de análise de sistemas de informação, no âmbito do processo de informatização de uma organização.



Apresentação do Módulo

Conteúdos

- Análise de sistemas – conceitos gerais
  - Definição
  - Classificação
  - Objectivos
- Metodologias de análise de sistemas
  - Classificação
  - Objectivos
- Ferramentas de análise estruturada
  - Diagrama de contexto
  - Diagrama de fluxo de dados (DFD)
- Dicionário de dados
  - Utilidade e regras de definição
  - Relação com o DFD
- Diagramas de entidade – associação (DEA)
  - Componentes dum DEA
- Definição detalhada de dados
  - Nome e descrição de dados
  - Campos chave
  - Simplificação das tabelas através de normalização
  - Tabelas de descrição de códigos
  - Modelos de dados
- Modelos físicos
  - Relacional
  - Rede
  - Hierárquico
- Modelos lógicos
  - Entidade-Associação
  - Semântico
- Organização de ficheiros versus bases de dados
  - Organização de ficheiros e modo de acesso
  - Relação entre ficheiros e bases de dados
- Ambiente de acesso a bases de dados
  - Independência dos dados
  - Inter-relação entre dados
  - Partilha na utilização dos dados
  - Integridade dos dados
  - Redundância da informação

http://www.catalogo.anqep.gov.pt/UFCD/Detalhe/766

Avaliação do módulo

Avaliação do Módulo:

- Teste Final 40%:
- Assiduidade: 5%
- Participação: 5%
- Comportamento 5%
- Trabalhos:45%

  (Grupos/Individual)

Objetivos da Sessão

- Conceitos Genéricos
  - Definição de um sistema de Informação e as suas componentes
  - Evolução SI

Sistema de Informação

O que é um sistema de Informação? https://www.youtube.com/watch?v=RdgFoFPTckw

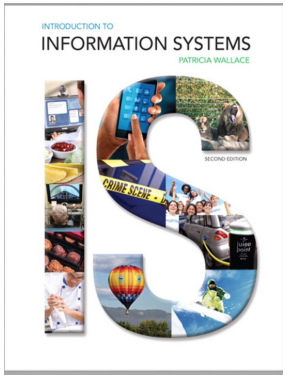
Definição:

Um **Sistema de informação (SI)** pode ser definido como um conjunto de **componentes inter-relacionados** que colecionam (ou recuperam), processam, armazenam e distribuem informação destinada a apoiar a tomada de decisões, a coordenação e o controle de uma organização.

Definição:

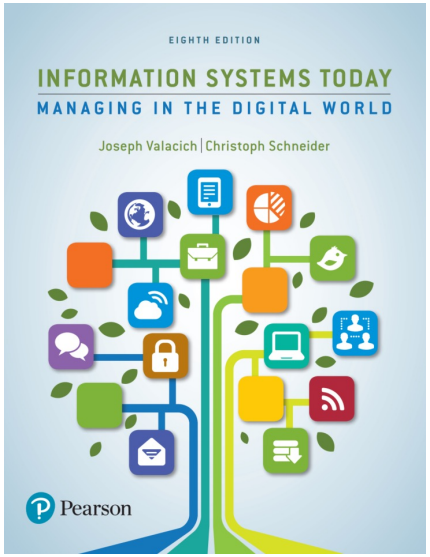
An information system (IS) is the **combination of people** and **information technology** that create, collect, process, store, and distribute **useful data**.

Information technology (IT) includes hardware, software, and telecommunications networks.

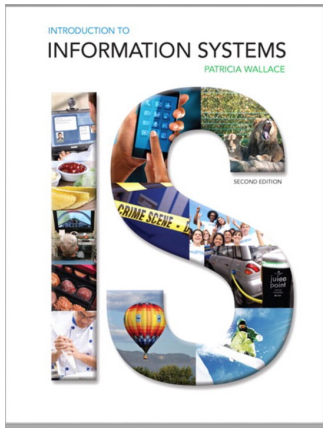


Definição:

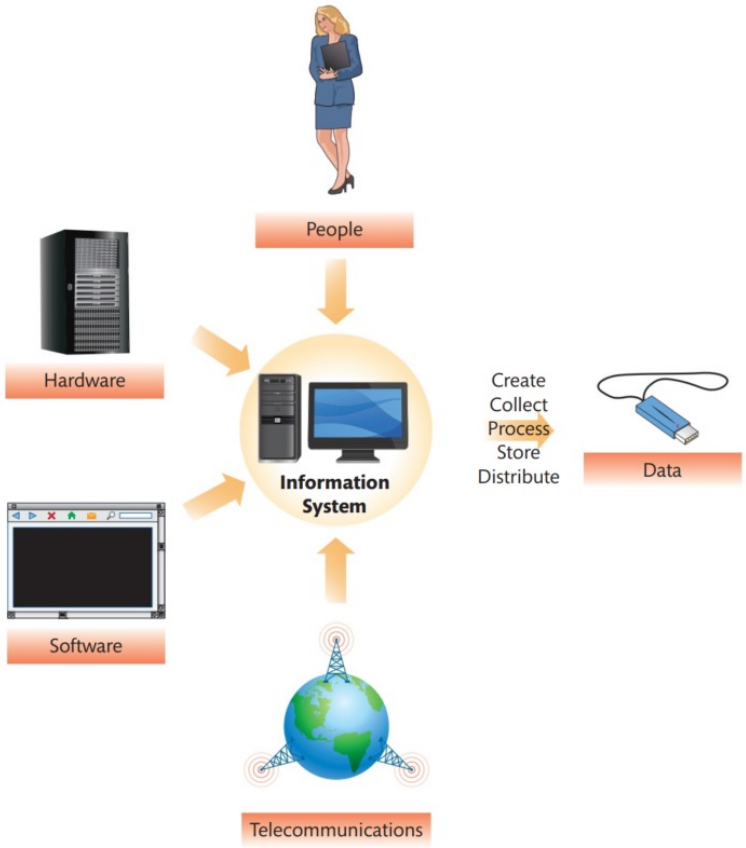

People
Hardware
Information System
Create
Collect
Process
Store
Distribute
Data
Software
Telecommunications


EIGHTH EDITION
INFORMATION SYSTEMS TODAY
MANAGING IN THE DIGITAL WORLD
Joseph Valacich | Christoph Schneider
Pearson

Definição:


INTRODUCTION TO
INFORMATION SYSTEMS
PATRICIA WALLACE
SECOND EDITION
CRIME SCENE


People
Technology
Processes
Data


People
Hardware
Software
Information System
Telecommunications
Create
Collect
Process
Store
Distribute
Data

Pessoas:

Além de dar apoio à tomada de decisões, à coordenação e ao controle, os sistemas de informação também auxiliam os gerentes e trabalhadores a analisar problemas, visualizar assuntos complexos e criar novos produtos

Pessoas:

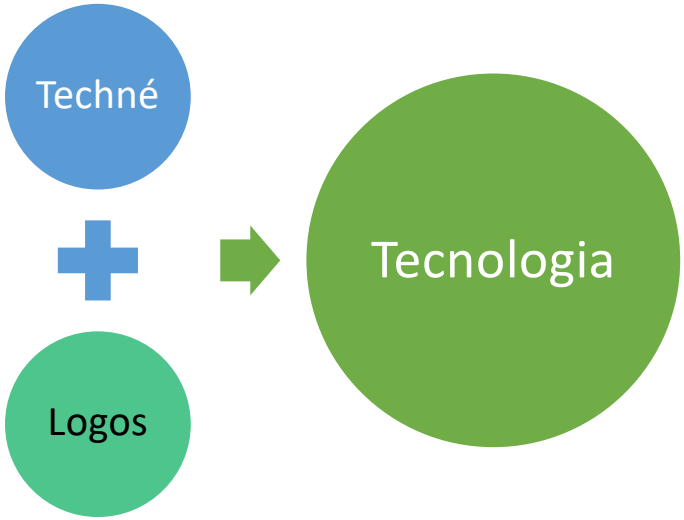
- Lideres
- Gestores e staff
- Equipa IT
- Operacionais
- Etc.

O fator humano desempenha um papel crucial no sucesso ou fracasso da maior parte dos Sistemas de Informação.

Tecnologia:

- Hardware
- Software
- Telecomunicações

Tecnologia:

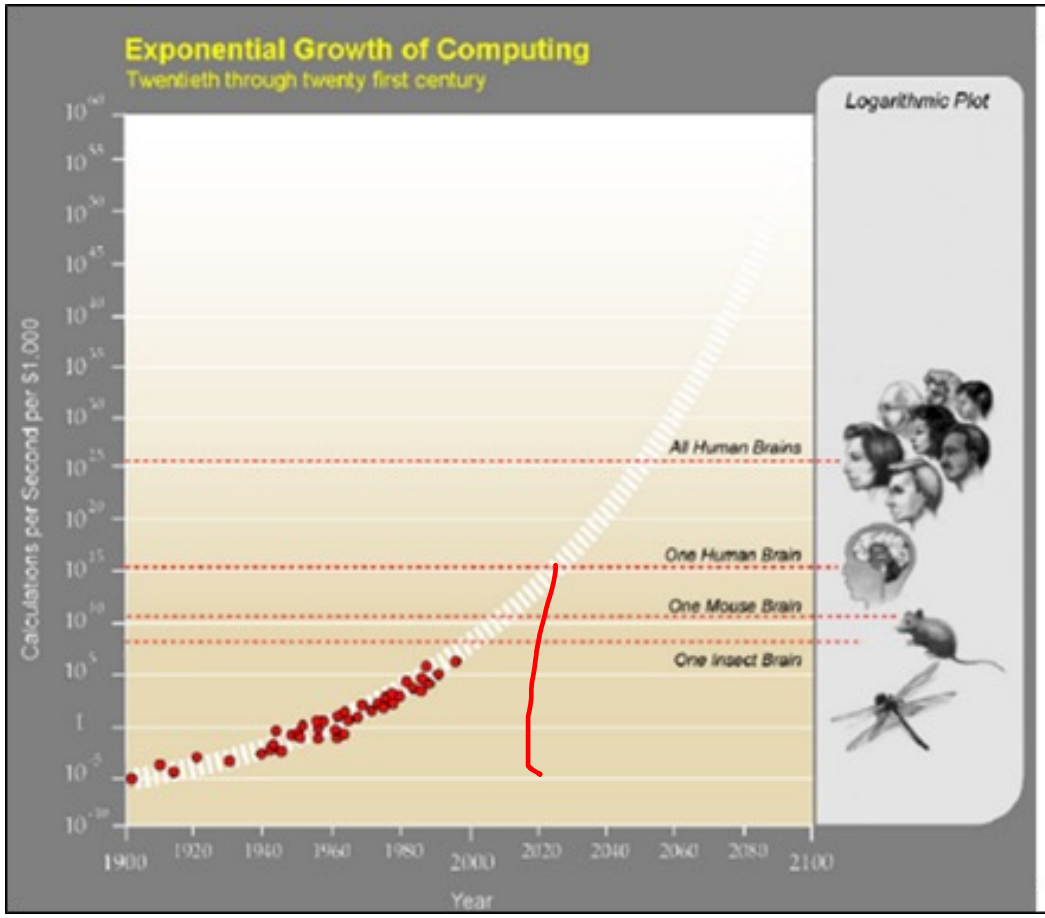


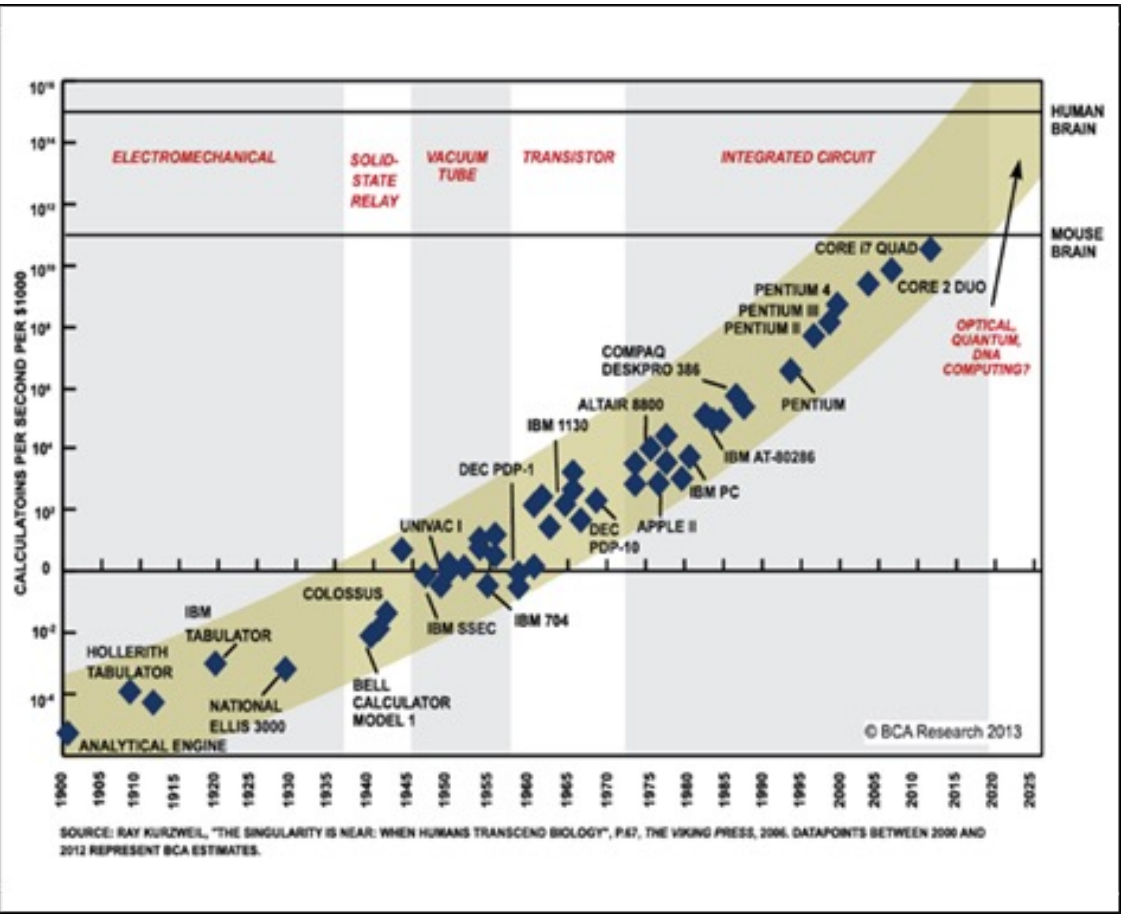
Manifestação do conhecimento e da razão na criação de objetos, mais ou menos complexos, que nos auxiliam na execução de tarefas.

Operacionalização do conhecimento científico

A **origem etimológica** do termo tecnologia tem a sua origem na Grécia antiga e resulta da conjugação do termo "**techné" (artefacto, artesanato, arte)** e **"Logos" (ordem, conhecimento, razão).**

Sistemas de Informação

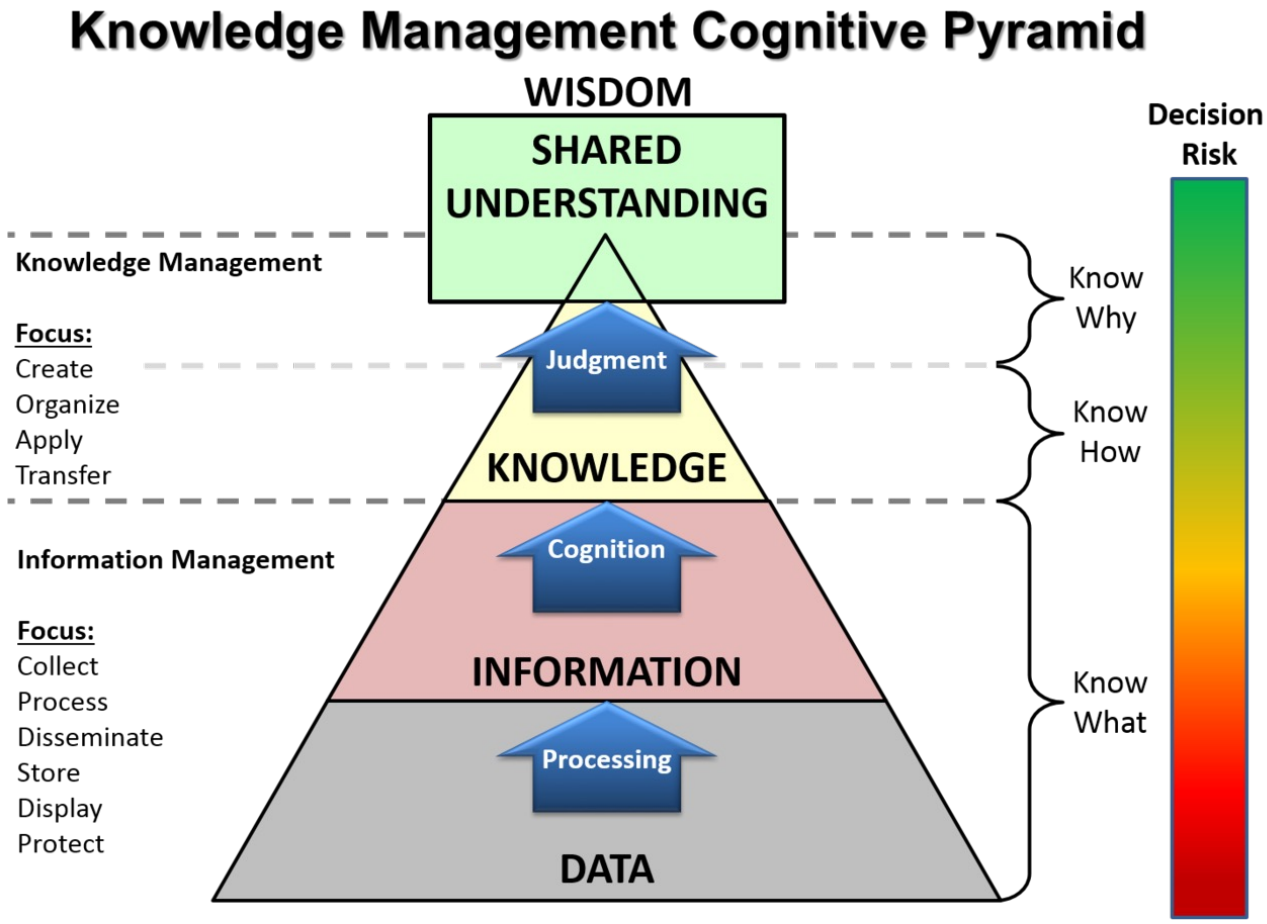




Dados:

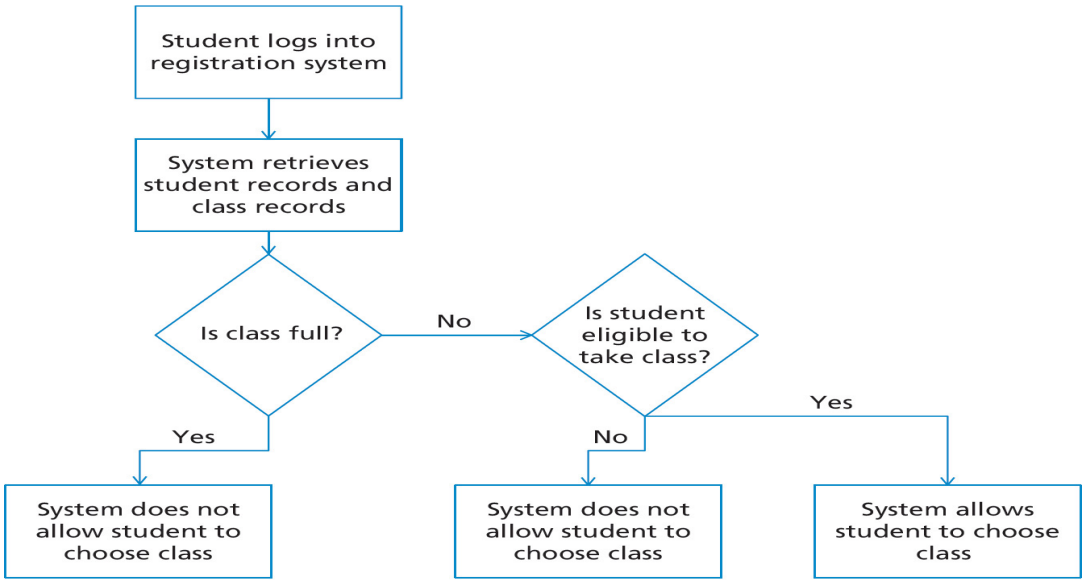
A base e propósito de todos os SI

Dados:

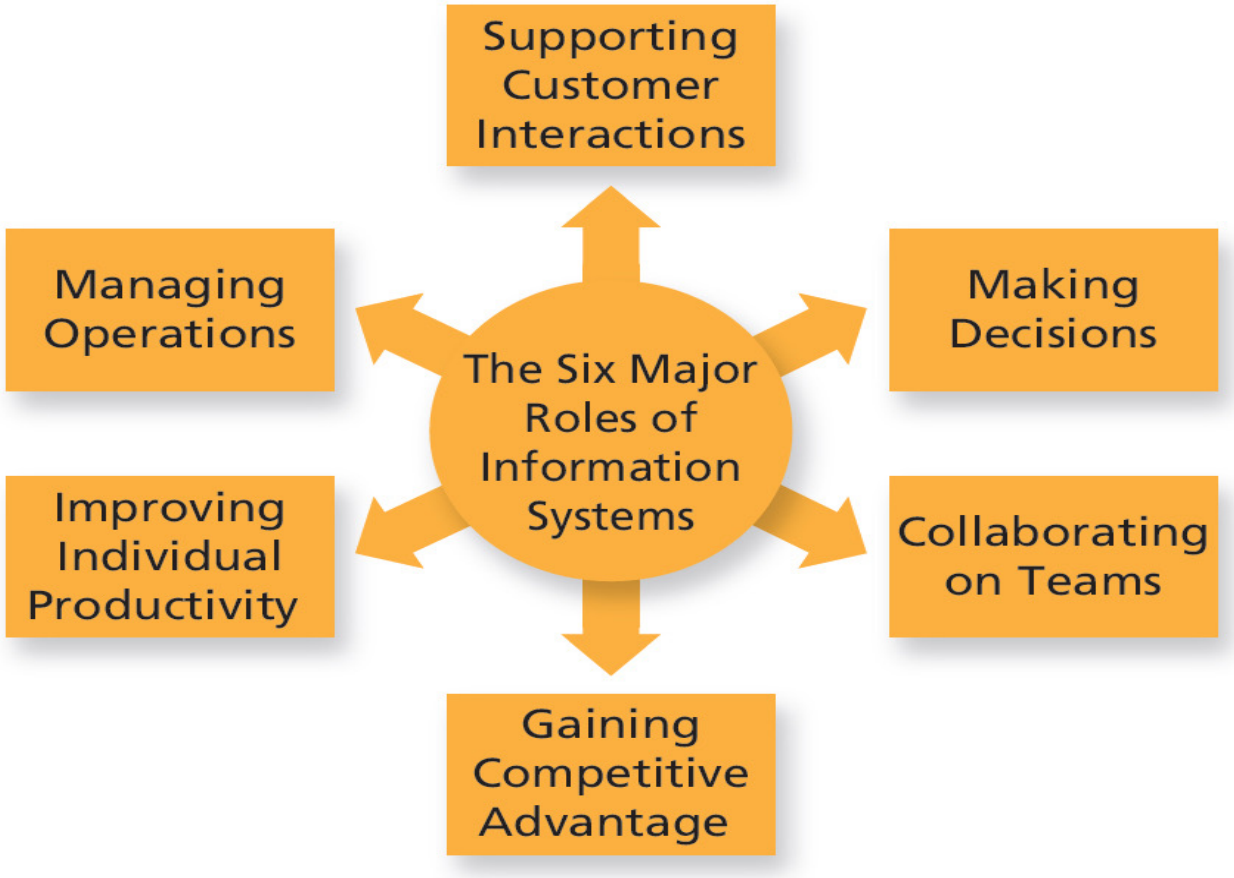

Knowledge Management Cognitive Pyramid
WISDOM
SHARED UNDERSTANDING
Judgment
KNOWLEDGE
Cognition
INFORMATION
Processing
DATA
Knowledge Management
Focus:
Create
Organize
Apply
Transfer
Information Management
Focus:
Collect
Process
Disseminate
Store
Display
Protect
Know Why
Know How
Know What
Decision Risk

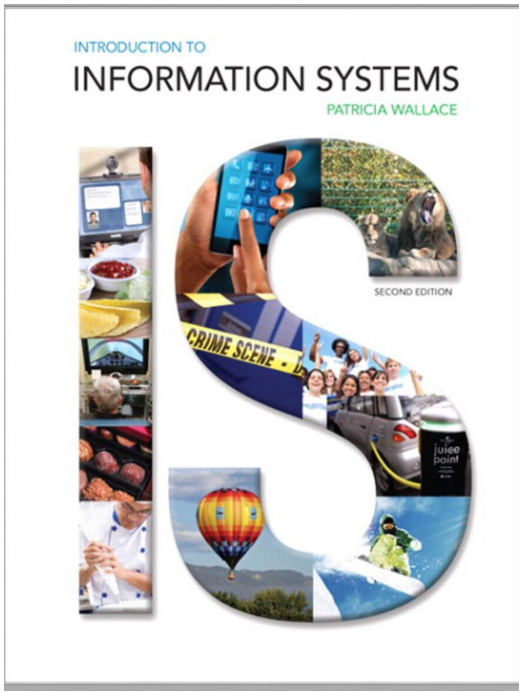
Processos:

Conjunto de atividades para desenvolver uma tarefa



Papel dos SI


Supporting Customer Interactions
Managing Operations
Making Decisions
The Six Major Roles of Information Systems
Improving Individual Productivity
Collaborating on Teams
Gaining Competitive Advantage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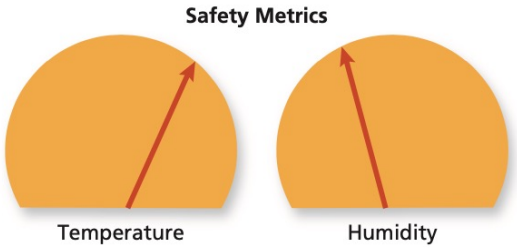
CRIME SCENE

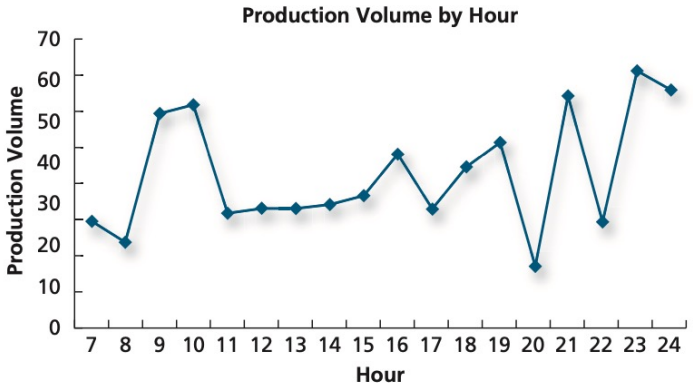
Managing Operations

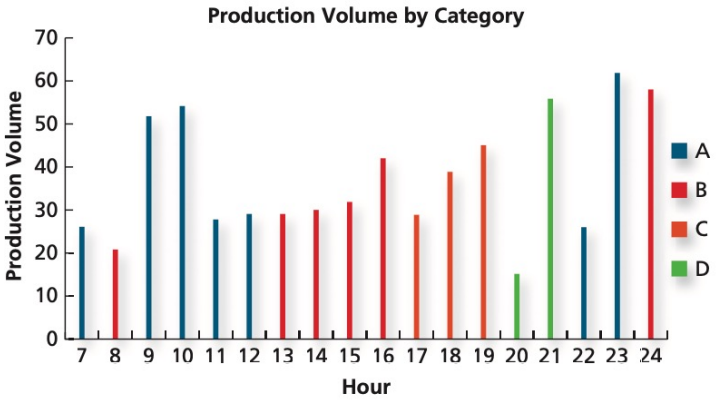
Todas as empresas de sucesso necessitam de SI que apoiem as suas operações.

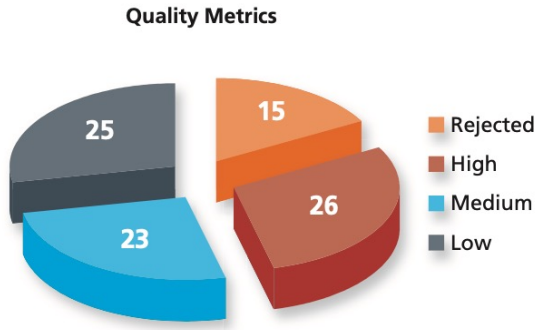
Os SI de informação estão presentes em todas as áreas de negócio:

- Vendas
- RH
- Stocks
- Produtividade
- Etc.









Interação com Clientes

Todas as interações com clientes (seja do ponto de vista comercial, estudantes numa universidade, utentes num hospital) são geridas por sistemas especializados (CRM - Customer relationship management)

Através do comércio digital, e serviços em Cloud, têm-se verificado um exponencial crescimento deste tipo de Sistemas.

Apoio à Decisão

Baseado em dados, e sistemas de machine Learning, SI cada vez mais inteligentes conseguem proporcionar insights (business intelligence) que apoiam a decisão das empresas a diversos níveis:

- Investimentos;
- Oportunidades de negócio;
- Ameaças;
- Etc.

How do managers answer questions like these?

Trabalho Colaborativo

Ferramentas de trabalho colaborativo permitem que equipas trabalhem conjuntamente a partir de qualquer lugar, ou a qualquer hora.

Um caso especial são as redes socias:

	% Internet Users Who Use . . .
Any social networking site	67%
Facebook	67%
LinkedIn	20%
Twitter	16%
Pinterest	15%
Instagram	13%
Tumblr	6%

Mas existem outros SI:
Office 365; Google; etc.

Vantagem competitiva

Todos os Sistemas que nos podem dar vantagem sobre os rivais.

Muitas vezes ligado à estratégia a médio longo prazo.

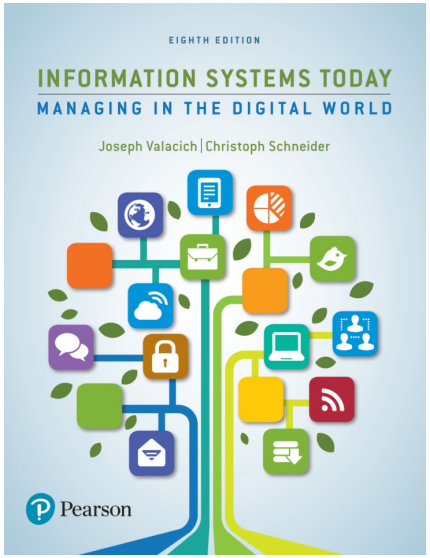
Produtividade Individual

SI com MS Word, EndNote, OneNote, Agendas, etc;

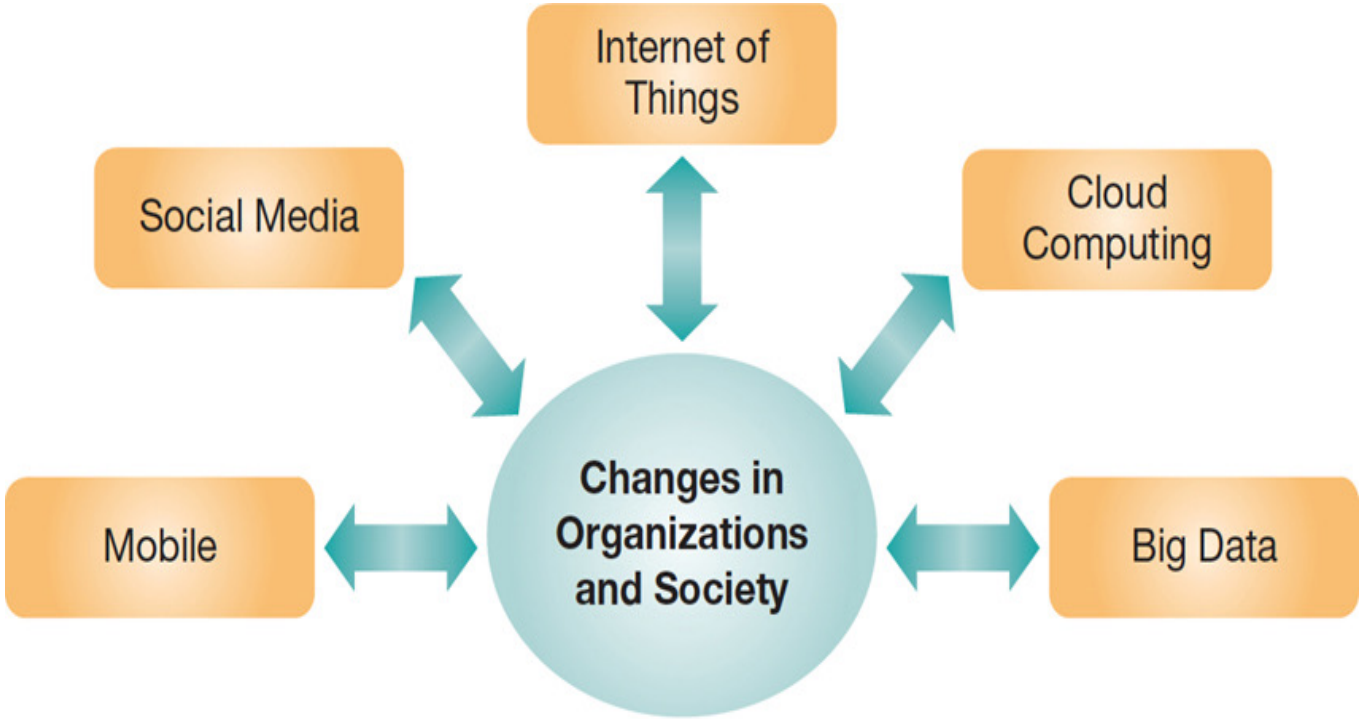
Apoiam os indivíduos a organizar o seu trabalho e a incrementar o seu desempenho

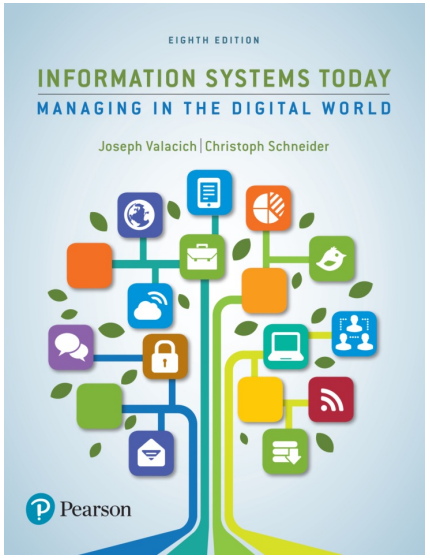
Papel dos SI

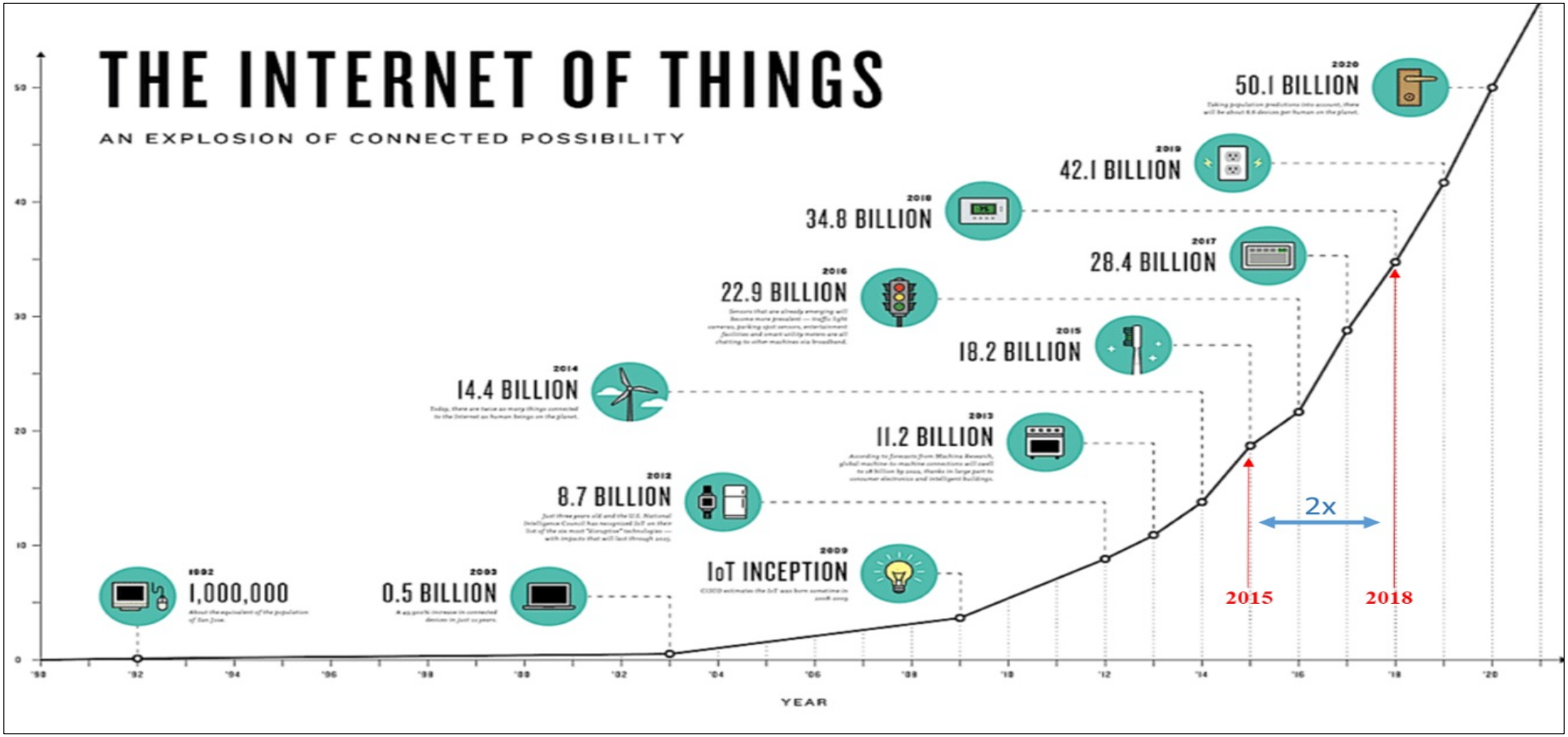
Categories	Categories
• Transaction processing system (TPS)	• Geographic information system (GPS)
• Management information system (MIS)	• Functional area information system
• Decision support system (DSS)	• Customer relation management (CRM system)
• Intelligent system	• Enterprise resource planning system (ERP)
• Business intelligence system	• Supply chain management system
• Office automation system	• Electronic commerce system
• Knowledge management system	• Mobile app
• Social software	blank



SI - Tendências






THE INTERNET OF THINGS
AN EXPLOSION OF CONNECTED POSSIBILITY
1992
1,000,000
2003
0.5 BILLION
2009
IoT INCEPTION
2012
8.7 BILLION
2013
11.2 BILLION
2014
14.4 BILLION
2015
18.2 BILLION
2016
22.9 BILLION
2017
28.4 BILLION
2018
34.8 BILLION
2019
42.1 BILLION
2020
50.1 BILLION
2x
2015
2018
YEAR

SI - Mobile

Talvez a era post-PC?

Implicações:

Consumo de IT;

Bring Your Own Device (B Y O D) para o local de trabalho - Segurança

SI – redes sociais

Over 4.6 billion (and growing) Facebook users share status updates or pictures with friends and family

Companies harness the power of the crowd by using social media to get people to participate in innovation and other activities

SI – Cloud computing

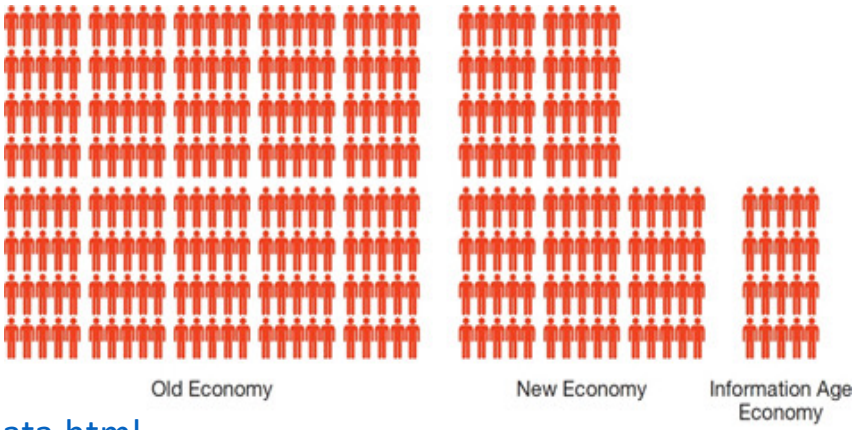
- Web technologies enable using the Internet as the platform for applications and data
- Applications that use to be installed on individual computers are increasingly kept in the cloud
  - e.g., Gmail, Google Docs, Google Calendar

Can enabled advanced analytics of massive amounts of Big Data

SI – Cloud computing

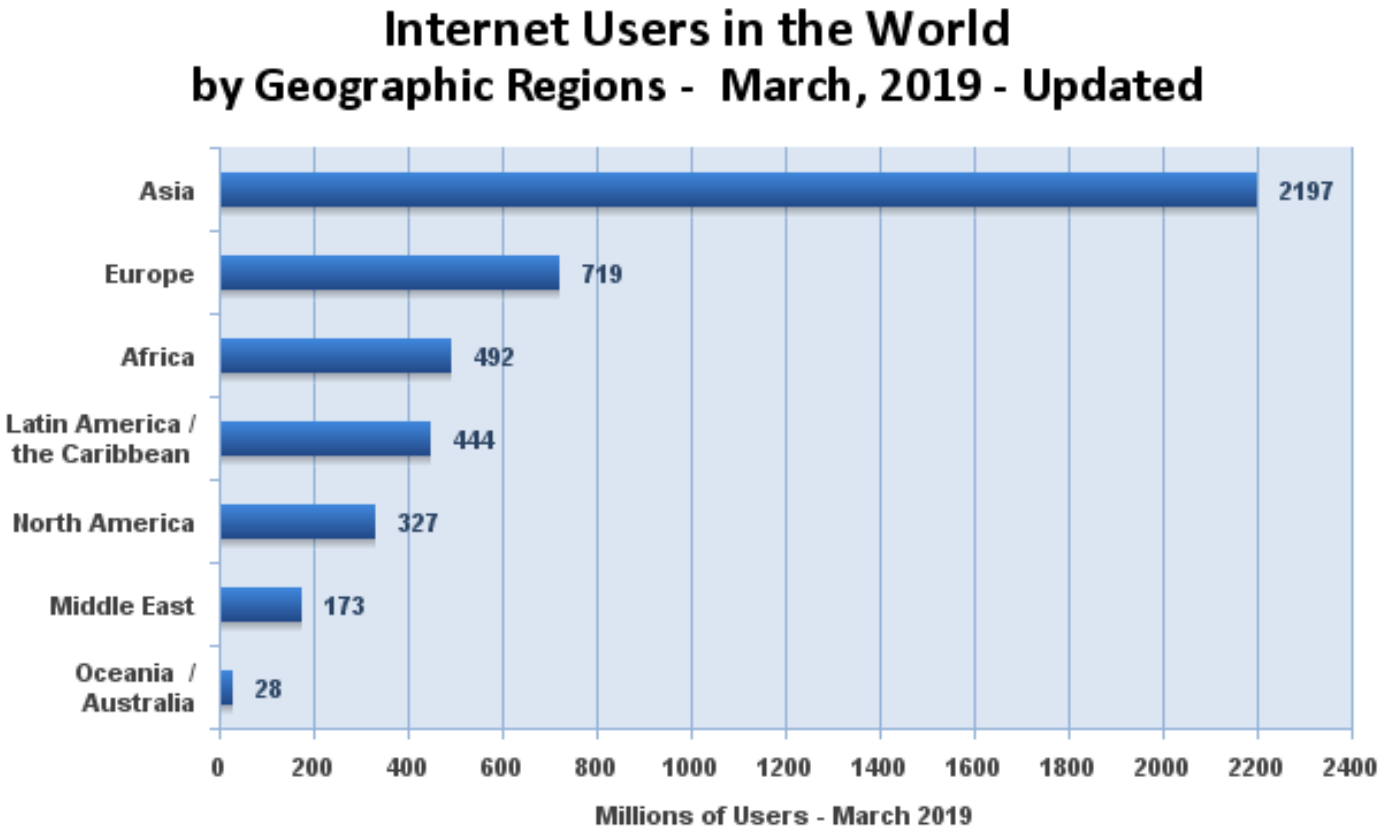
SI – Big data

- In 2013, 4.4 zettabytes of data were generated and consumed
- What would that amount equal? It is 4.4 trillion gigabytes, or the equivalent of about 140 billion 32GB iPads (IDC, 2013)
- Forecasted to grow to 180 zettabytes by 2025



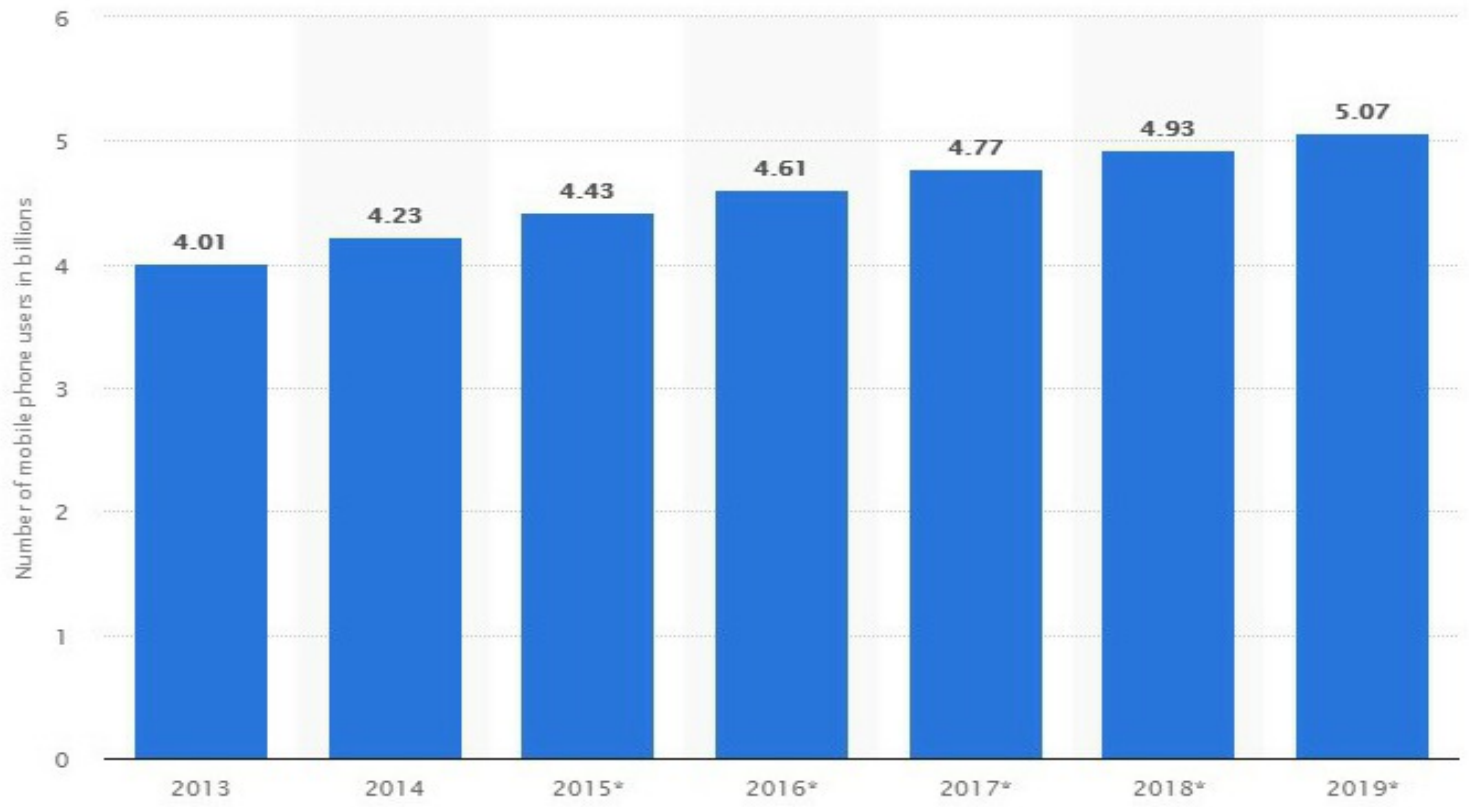
https://www.sas.com/pt_pt/insights/big-data/what-is-big-data.html

SI – Alguns números



Source: Internet World Stats - www.internetworldstats.com/stats.htm

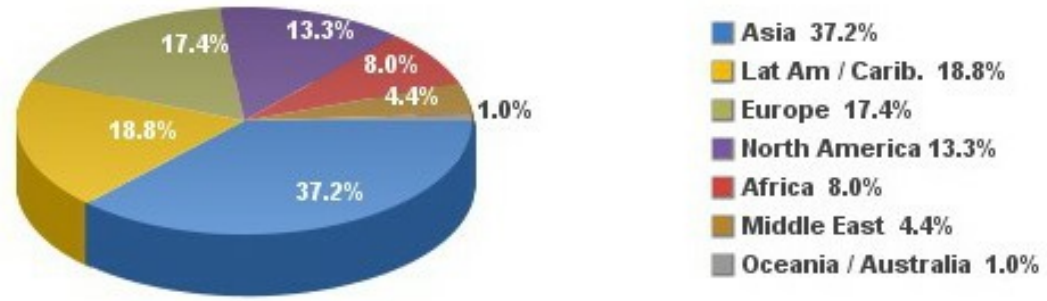
SI – Alguns números



World wide mobile phone users (Source: Statista)

SI – Alguns números

Facebook Usage and Facebook Growth Statistics By World Geographic Regions



Facebook users world wide in June 2017 (Source: Internet World Stats)

In 2018, of the 2.2 billion users who regularly use Facebook, only half them spoke English and only 10% were from the US.

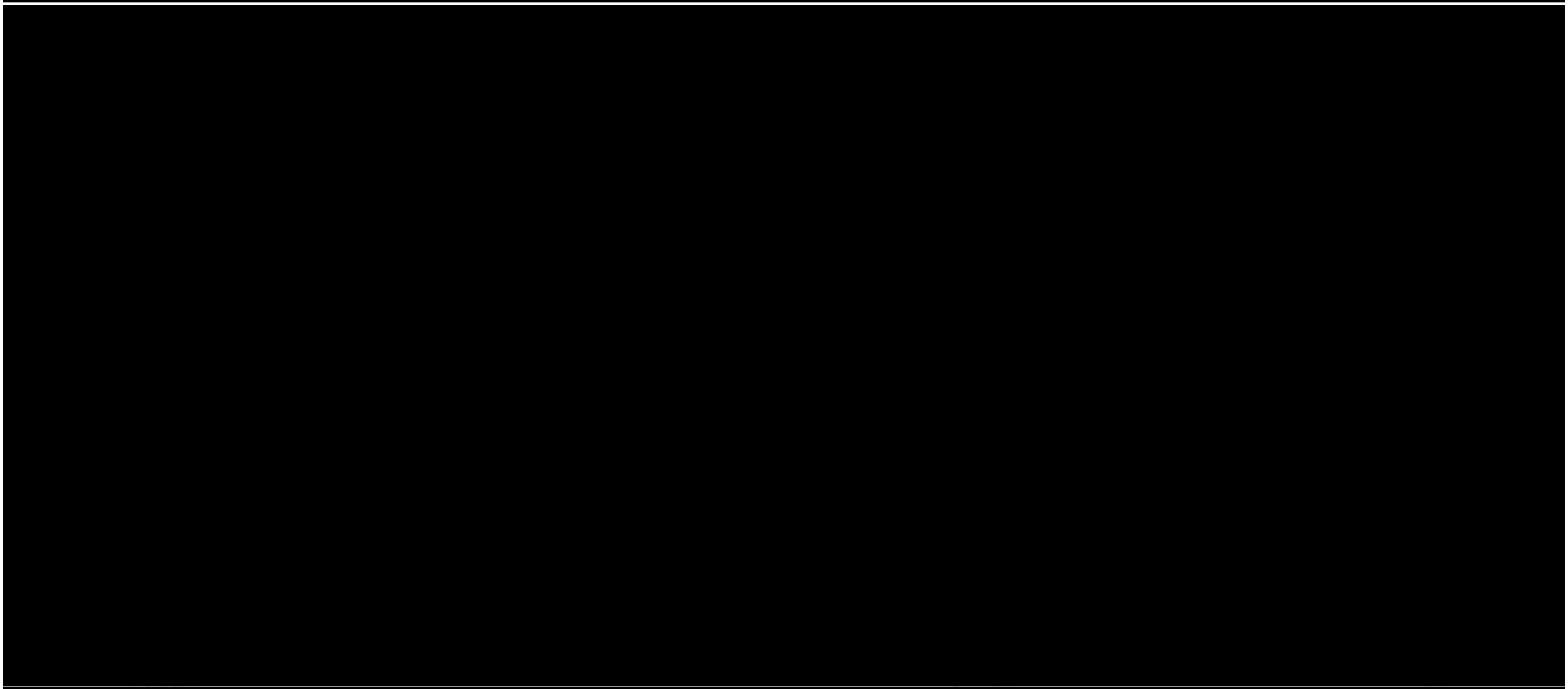
SI – Alguns números

Wearable Devices Worldwide (millions of units)

Device	2016	2017	2018	2021	
Smartwatch	34.80	41.50	48.20	80.96	x2,3
Head-mounted display	16.09	22.01	28.28	67.17	x4
Body-worn camera	0.17	1.05	1.59	5.62	x30
Bluetooth headset	128.50	150.00	168.00	206.00	
Wristband	34.97	44.10	48.84	63.86	
Sports watch	21.23	21.43	21.65	22.31	
Other fitness monitor	55.46	55.7	56.23	58.73	
Total	**265.88**	**310.37**	**347.53**	**504.65**	

Wearable Devices Actual and Forecast (Source: Gartner Group, August 2017)

SI – Constante evolução



SI – Constante evolução

SI – Constante evolução

2077 – 10 segundos para o futuro (4 episódios - RTP)

https://www.rtp.pt/play/p4286/2077-10-segundos-para-o-futuro
https://www.rtp.pt/play/p4286/e325010/2077-10-segundos-para-o-futuro
https://www.rtp.pt/play/p4286/e326158/2077-10-segundos-para-o-futuro
https://www.rtp.pt/play/p4286/e328635/2077-10-segundos-para-o-futuro

Documentários Cambridge Analytica (Netflix) - https://www.netflix.com/pt/title/80117542

Documentários O dilema das redes sociais (Netflix) - https://www.netflix.com/pt/title/81254224

Recapitular

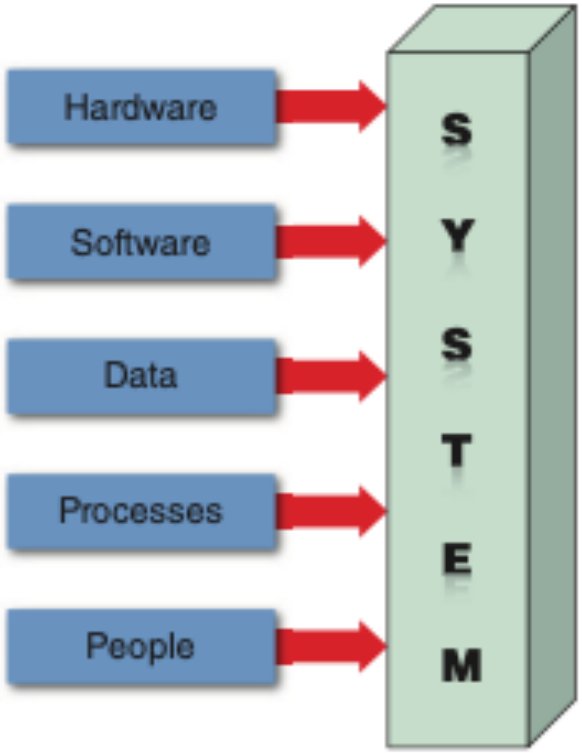
Information technology (IT) refers to the combination of **hardware**, **software**, and **services** that people use to manage, communicate, and share information.

IT => Profound influence on modern life

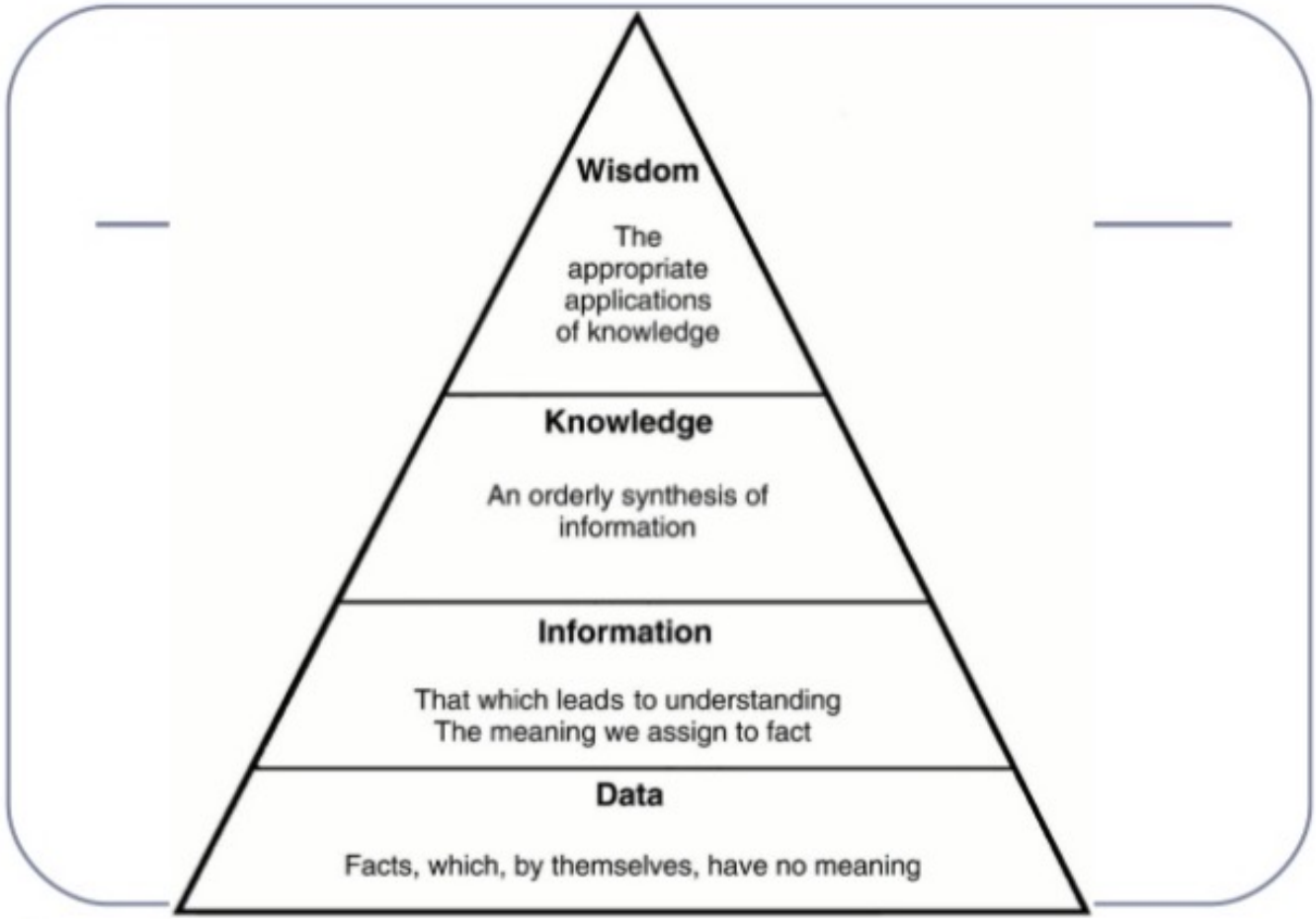
Definição:

An information system (IS) is the **combination of people** and **information technology** that create, collect, process, store, and distribute **useful data**.

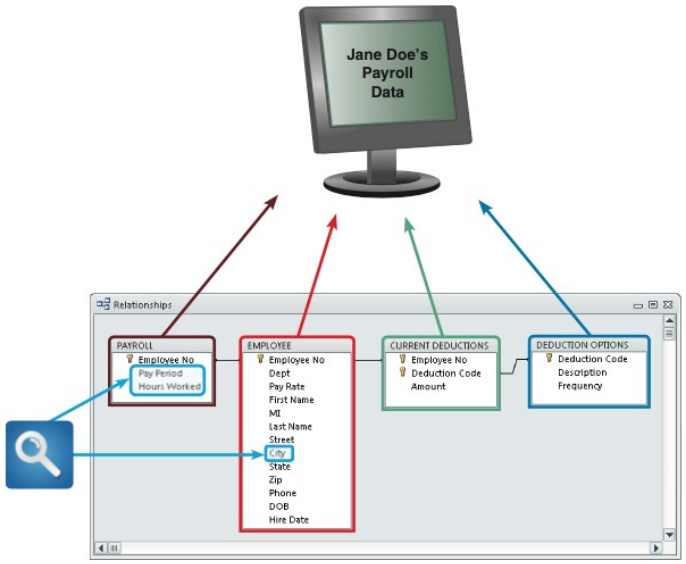
Information technology (IT) includes hardware, software, and telecommunications networks (services).



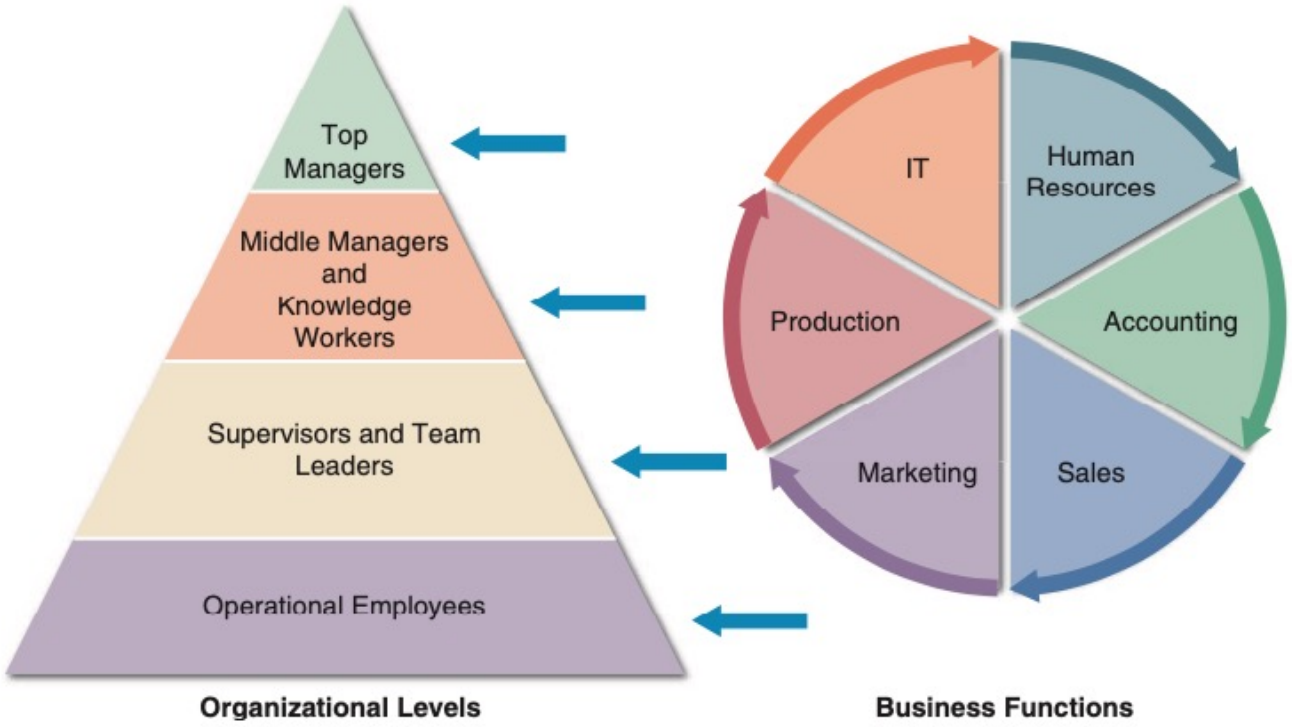
Recapitular



To design successful systems, systems analysts must understand a company's business operations



What information do users need?



A systems analyst **must understand** the company's organizational model to recognize who is responsible for specific processes and decisions and to be aware of what information is required by whom.

What information do users need?

Top Managers

Top managers **develop long-range plans, called strategic plans**, which define the company's overall mission and goals.

To plot a future course, top managers ask questions such as:

- How much should the company invest in information technology?
- How much will Internet sales grow in the next five years?
- Should the company build new factories or contract out production functions?

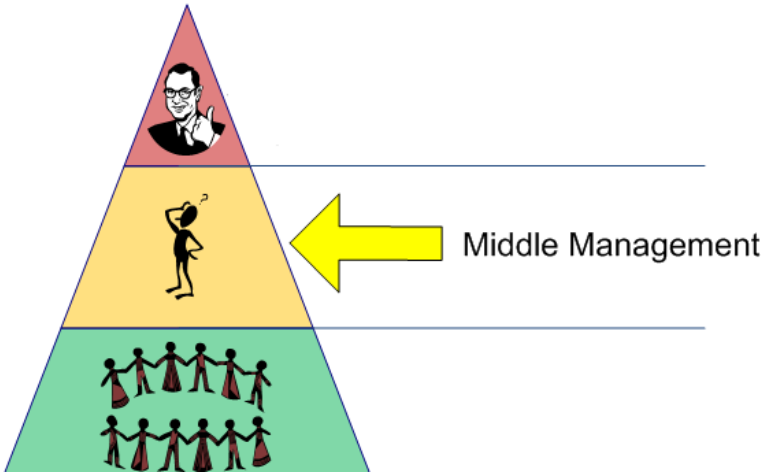
To develop a strategic plan, top managers also need information from outside the company, such as economic forecasts, technology trends, competitive threats, and governmental issues

What information do users need?

Middle Managers and Knowledge Workers

Middle managers **provide direction**, necessary resources, and performance feedback to supervisors and team leaders.

Because they focus on a somewhat shorter time frame, middle managers need more detailed information than top managers, but somewhat less than supervisors who oversee day-to-day operations



Knowledge workers include systems analysts, programmers, accountants, researchers, trainers, human resource specialists, and other professionals. Knowledge workers also use business support systems, knowledge management systems, and user productivity systems.

What information do users need?

Supervisors and Team leaders

Supervisors, often called team leaders, oversee operational employees and carry out day-to-day functions. They coordinate operational tasks and people, make necessary decisions, and ensure that the right tools, materials, and training are available.

Like other managers, supervisors and team leaders need decision support information, knowledge management systems, and user productivity systems to carry out their responsibilities.

What information do users need?

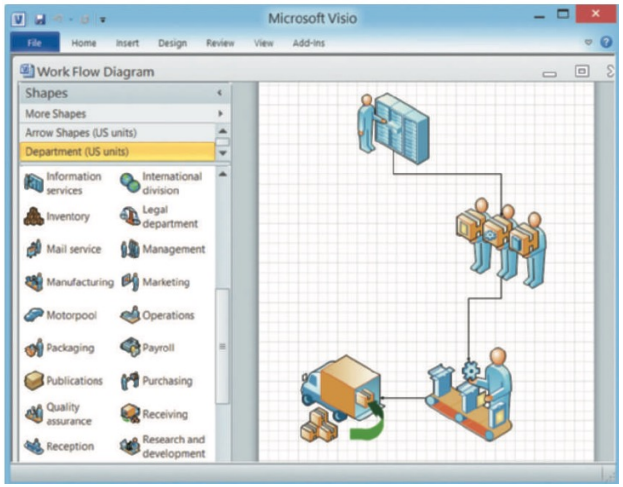
Operational Employees

Operational employees include users who rely on transaction processing systems to enter and receive data they need to perform their jobs

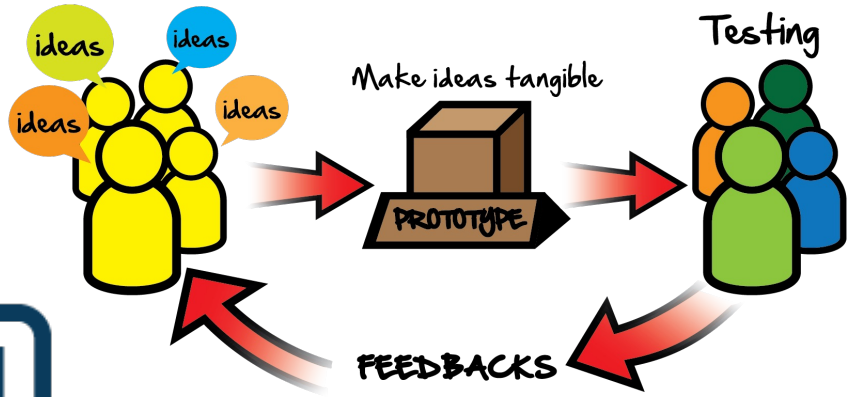
In many companies, operational users also need information to handle tasks and make decisions that were assigned previously to supervisors. This trend, called empowerment, gives employees more responsibility and accountability. Many companies find that empowerment improves employee motivation and increases customer satisfaction.

What information do users need?

System Development Tools



Modeling

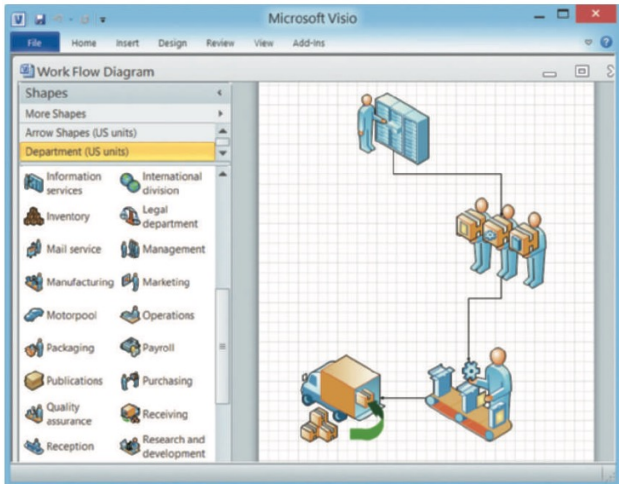


Prototyping

Computer-Aided Systems Engineering (CASE) tools

Modeling

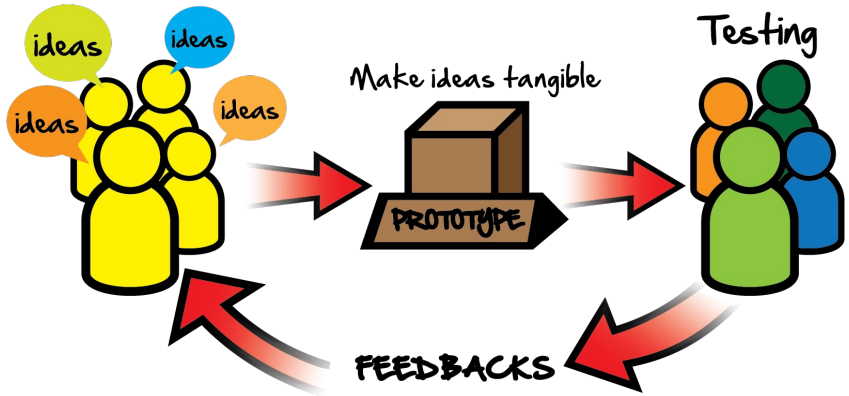
Modeling produces a **graphical representation** of a concept or process that systems developers can analyze, test, and modify. A systems analyst can describe and simplify an information system by using a set of business, data, object, network, and process models.



A business model describes the information that a system must provide. Analysts also create models to represent data, objects, networks, and other system components. Although the models might appear to overlap, they actually work together to describe the same environment from different points of view.

Prototyping

Tests system concepts and provides an opportunity to examine input, output, and user interfaces before final decisions are made. A prototype is an early working version of an information system.



A prototype can serve as an initial model that is used as a benchmark to evaluate the finished system, or the prototype itself can develop into the final version of the system. Either way, prototyping speeds up the development process significantly.

Computer-Aided Systems Engineering (CASE) tools

Computer-aided systems engineering (CASE), also called computer-aided software engineering, is a technique that uses powerful software, called CASE tool, to help systems analysts develop and maintain information systems.

Because CASE tools make it easier to build an information system, they boost IT productivity and improve the quality of the finished product.

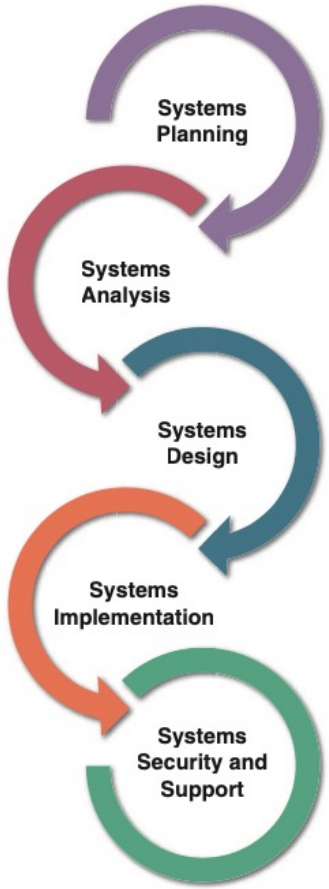
After developing a model, many CASE tools can generate program code, which speeds the implementation process.

System Development Methods

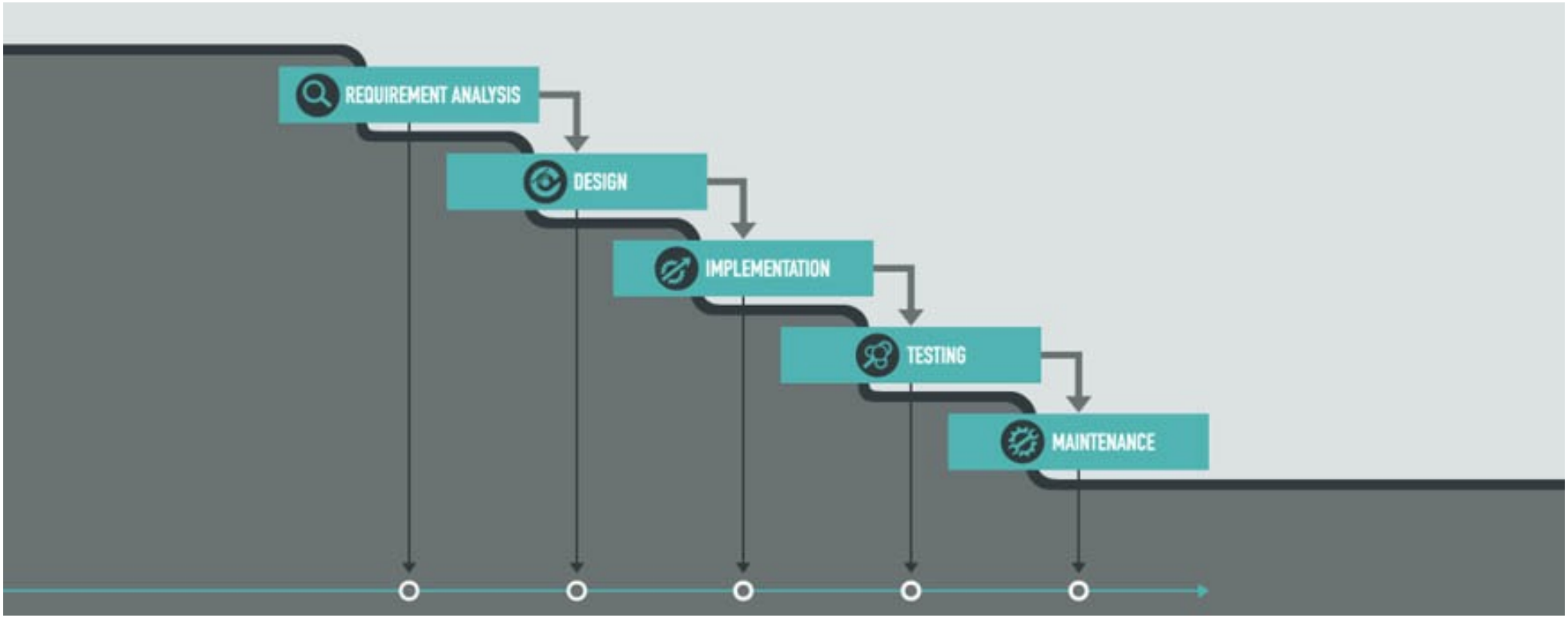
	STRUCTURED ANALYSIS	OBJECT-ORIENTED ANALYSIS	AGILE METHODS
Description	Represents the system in terms of data and the processes that act upon that data. System development is organized into phases, with deliverables and milestones to measure progress. The waterfall model typically consists of five phases: requirements, design, construction, testing, and maintenance & evolution. Iteration is possible among the phases.	Views the system in terms of objects that combine data and processes. The objects represent actual people, things, transactions, and events. Compared to structural analysis, O-O phases tend to be more interactive. Can use the waterfall model or a model that stresses greater iteration.	Stresses intense team-based effort. Breaks development into cycles, or iterations, that add functionality. Each cycle is designed, built, and tested in an ongoing process. Attempts to reduce major risks by incremental steps in short time intervals.

Structured Analysis

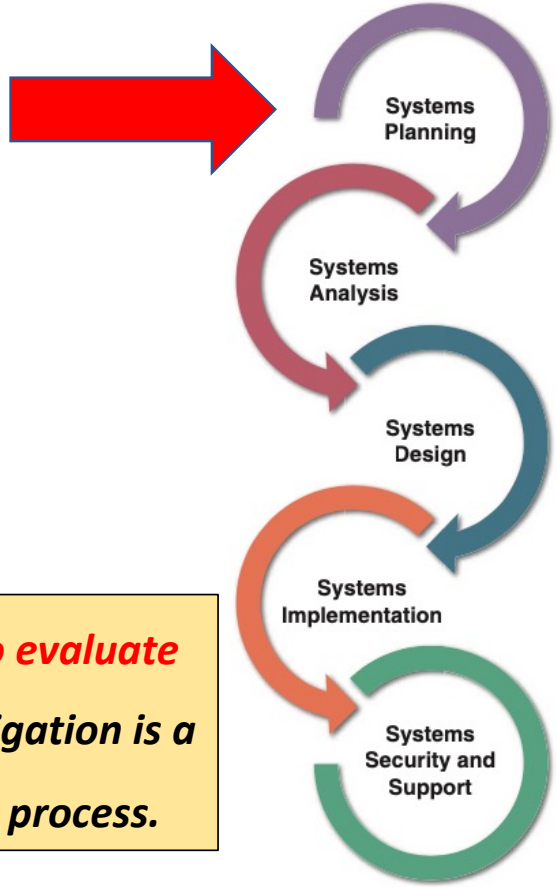
Structured analysis is a traditional systems development technique that is time-tested and easy to understand. Structured analysis uses a series of phases, called the systems development life cycle (SDLC), to **plan, analyze, design, implement, and support** an information system.



Structured Analysis (Waterfall)



Structured Analysis -> Planning Phase



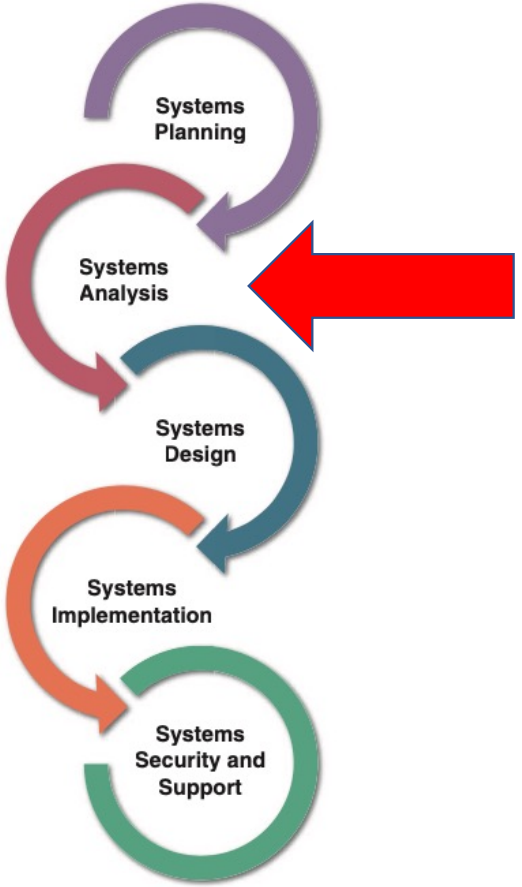
The systems planning phase usually begins with a formal request to the IT department, called a systems request, which describes problems or desired changes in an information system or a business process. In many companies, IT systems planning is an integral part of overall business planning

The purpose of this phase is to perform a preliminary investigation to evaluate an IT-related business opportunity or problem. The preliminary investigation is a critical step because the outcome will affect the entire development process.

Structured Analysis -> System Analysis

The purpose of the systems analysis phase is to **build a logical model of the new system**. The first step is requirements modeling, where the analyst investigates business processes and documents what the new system must do to satisfy users. Requirements modeling continues the investigation that began during the systems planning phase.

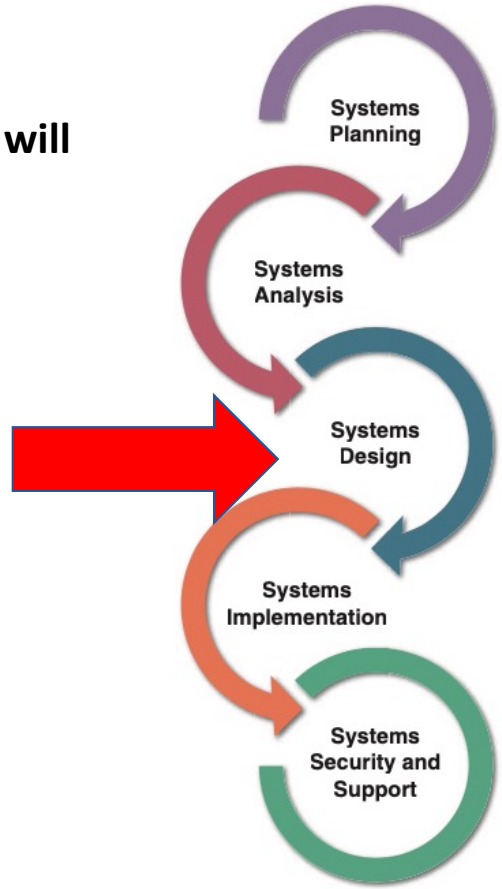
To understand the system, fact-finding using techniques such as interviews, surveys, document review, observation, and sampling is performed. The fact-finding results are used to build business models, data and process models, and object models.



Structured Analysis -> System Design

The purpose of the systems design phase is to **create a physical model that will satisfy all documented requirements for the system**. At this stage, the user interface is designed and necessary outputs, inputs, and processes are identified.

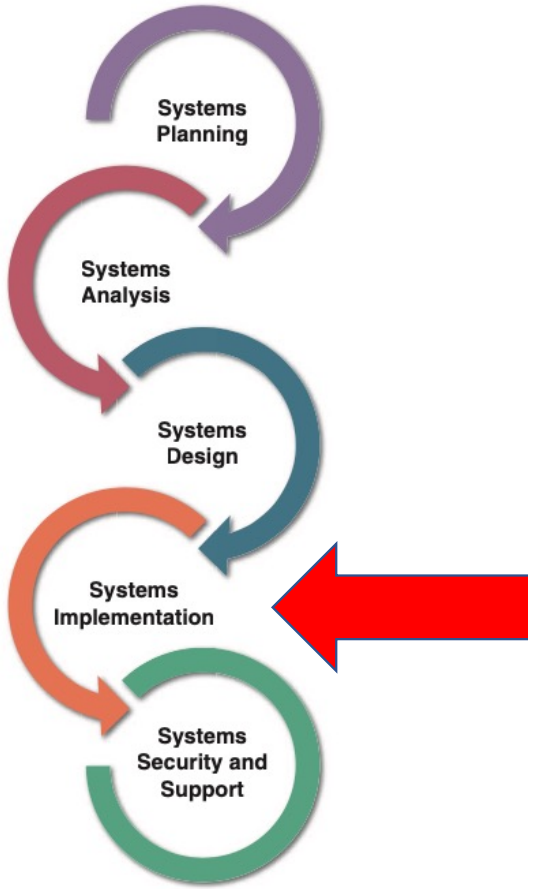
In addition, internal and external controls are designed, including computer-based and manual features to guarantee that the system will be reliable, accurate, maintainable, and secure.



Structured Analysis -> System Implementation

During the systems implementation phase, the new system is constructed.

The objective of the systems implementation phase is to deliver a completely functioning and documented information system. At the conclusion of this phase, the system is ready for use. Final preparations include converting data to the new system's files, training users, and performing the actual transition to the new system.

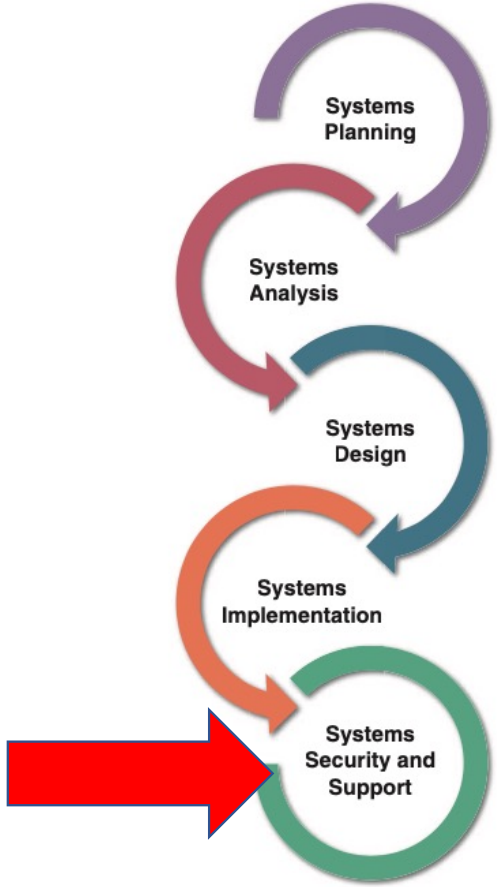


Structured Analysis -> System Support

During the systems support and security phase, the IT staff maintains, enhances, and protects the system. Maintenance changes correct errors and adapt to changes in the environment, such as new tax rates.

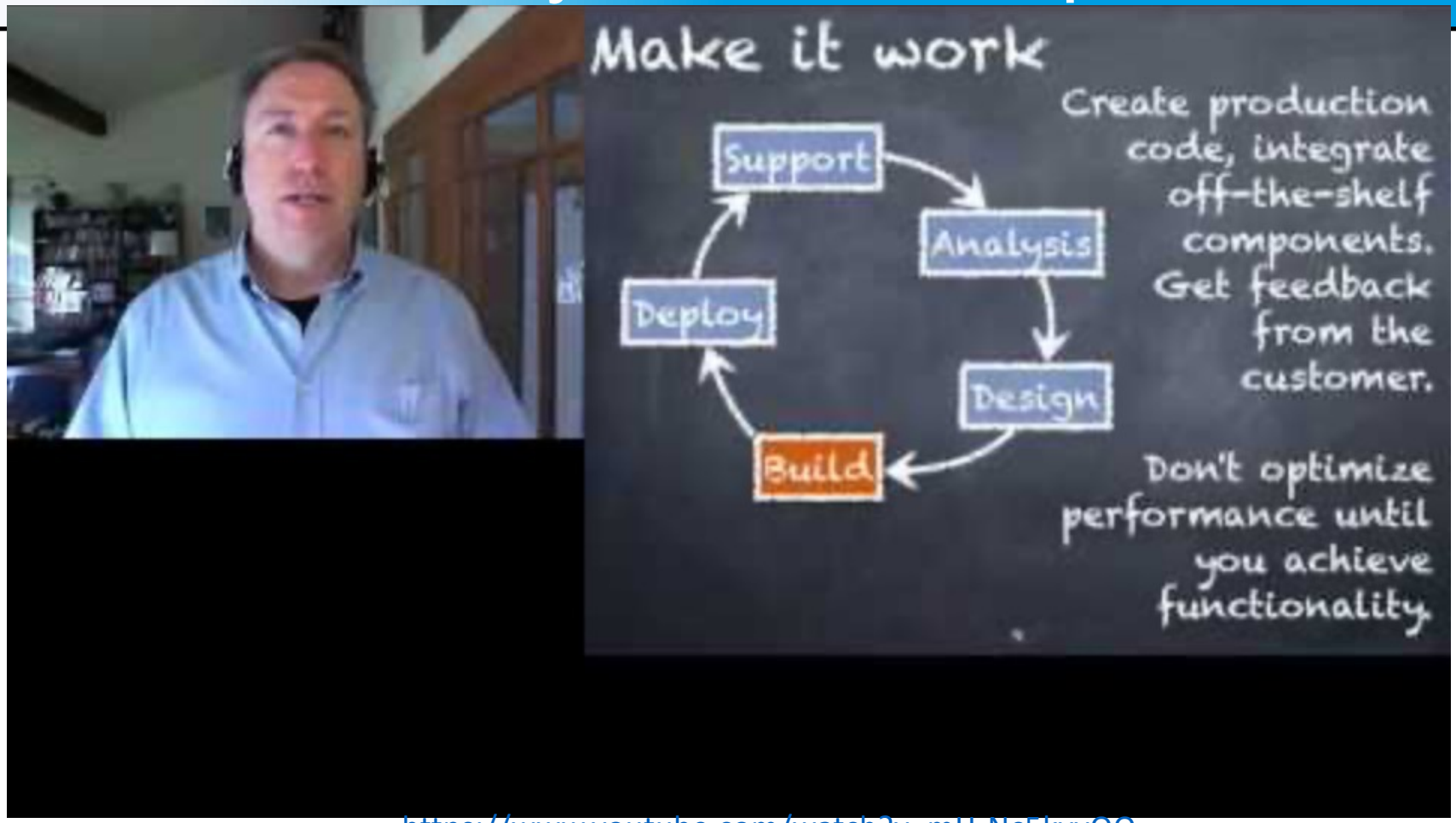
Information systems development is always a work in progress.

Business processes change rapidly, and most information systems need to be updated significantly or replaced after several years of operation.



System Development Methods

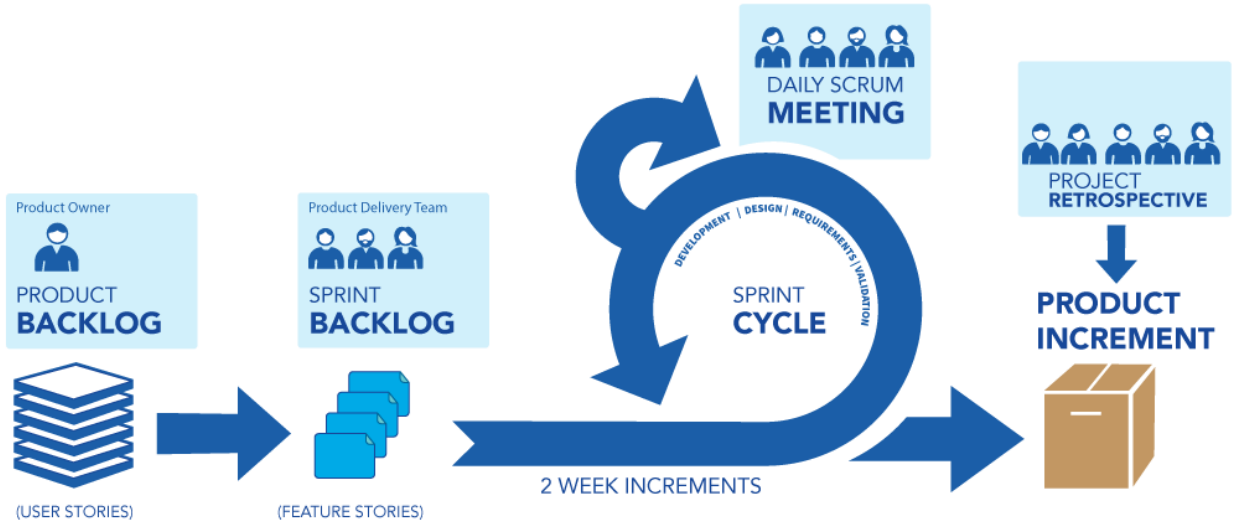
SDLC



https://www.youtube.com/watch?v=mH-Nc5kvyQQ

Agile Methods

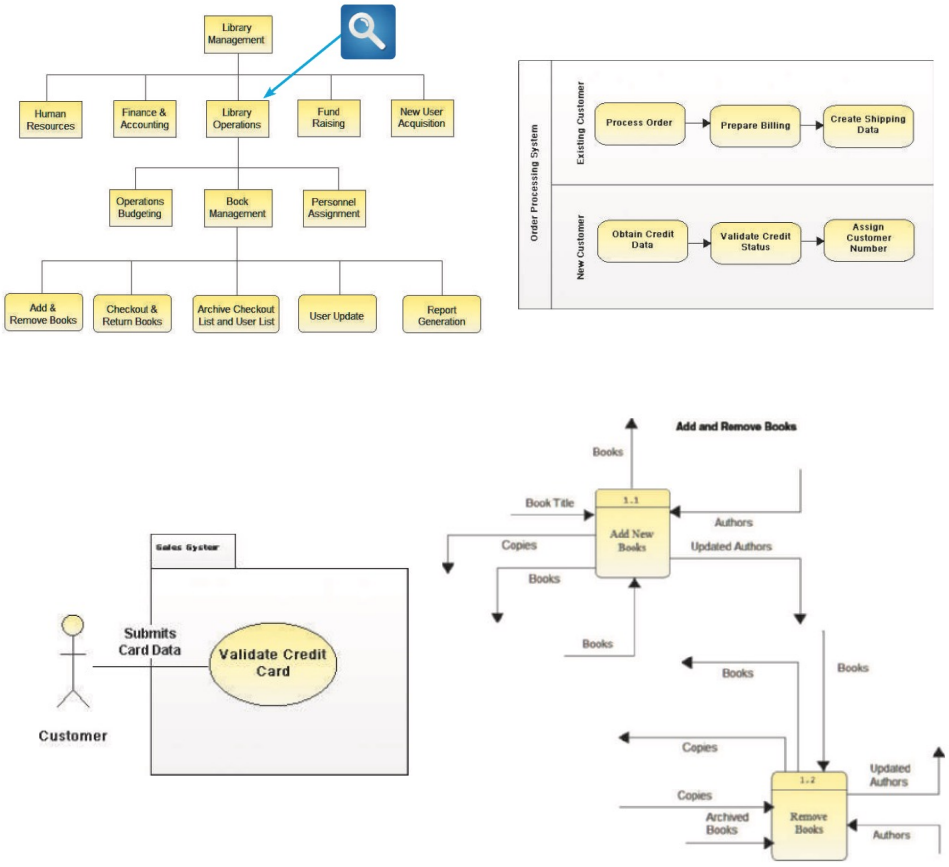
Development techniques change over time. For example, structured analysis is a traditional approach, and agile methods are the newest development. Structured analysis builds an overall plan for the information system, just as a contractor might use a blueprint for constructing a building. **Agile methods, in contrast, attempt to develop a system incrementally, by building a series of prototypes and constantly adjusting them to user requirements**.



System Development Methods

	STRUCTURED ANALYSIS	OBJECT-ORIENTED ANALYSIS	AGILE METHODS
Pros	Traditional method that has been very popular over time. Relies heavily on written documentation. Frequent phase iteration can provide flexibility comparable to other methods. Well-suited to traditional project management tools and techniques.	Integrates easily with object-oriented programming languages. Code is modular and reusable, which can reduce cost and development time. Easy to maintain and expand because new objects can be created using inherited properties.	Very flexible and efficient in dealing with change. Stresses team interaction and reflects a set of community-based values. Frequent deliverables constantly validate the project and reduce risk.
Cons	Changes can be costly, especially in later phases. Requirements are defined early, and can change during development. Users might not be able to describe their needs until they can see examples of features and functions.	Somewhat newer method might be less familiar to development team members. Interaction of objects and classes can be complex in larger systems.	Team members need a high level of technical and communications skills. Lack of structure and documentation can introduce risk factors. Overall project might be subject to scope change as user requirements change.

Modelos



Models help users, managers, and IT professionals **understand the design of a system**. Modeling involves graphical methods and nontechnical language that represent the system.

Systems analysts use modeling and fact-finding interactively — first they build fact-finding results into models, then they study the models to determine whether additional fact-finding is needed.

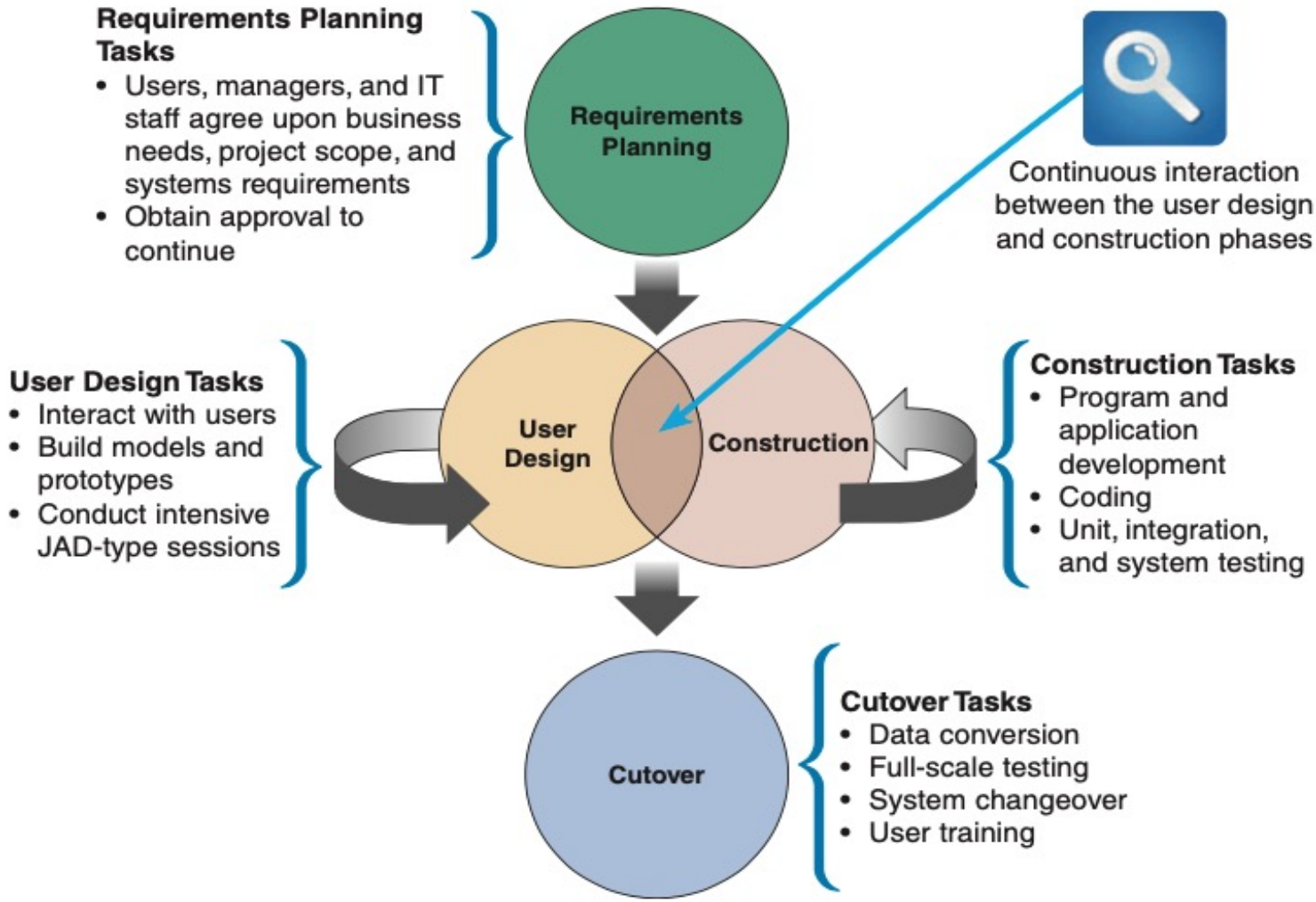
Requisitos de Sistema

During requirements modeling, systems developers must identify and describe all system requirements.

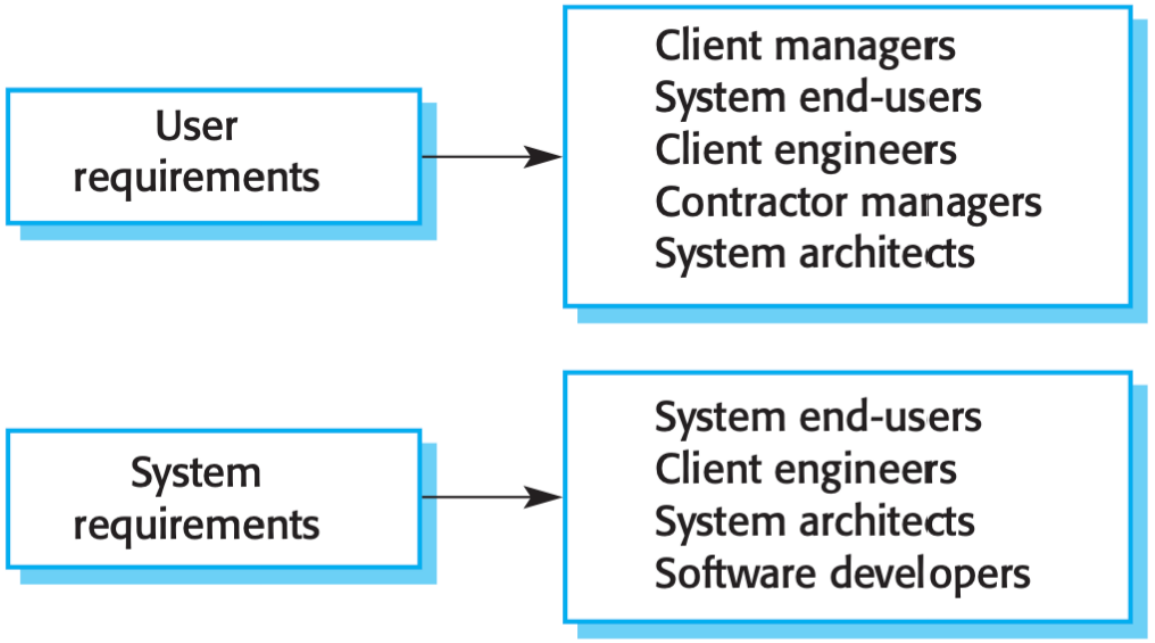
System Requirement is a characteristic or feature that must be included in an information system to satisfy business requirements and be acceptable to users.

System requirements serve as benchmarks to measure the overall acceptability of the finished system.

Requisitos de Sistema - Técnicas



Requirements



Requirements

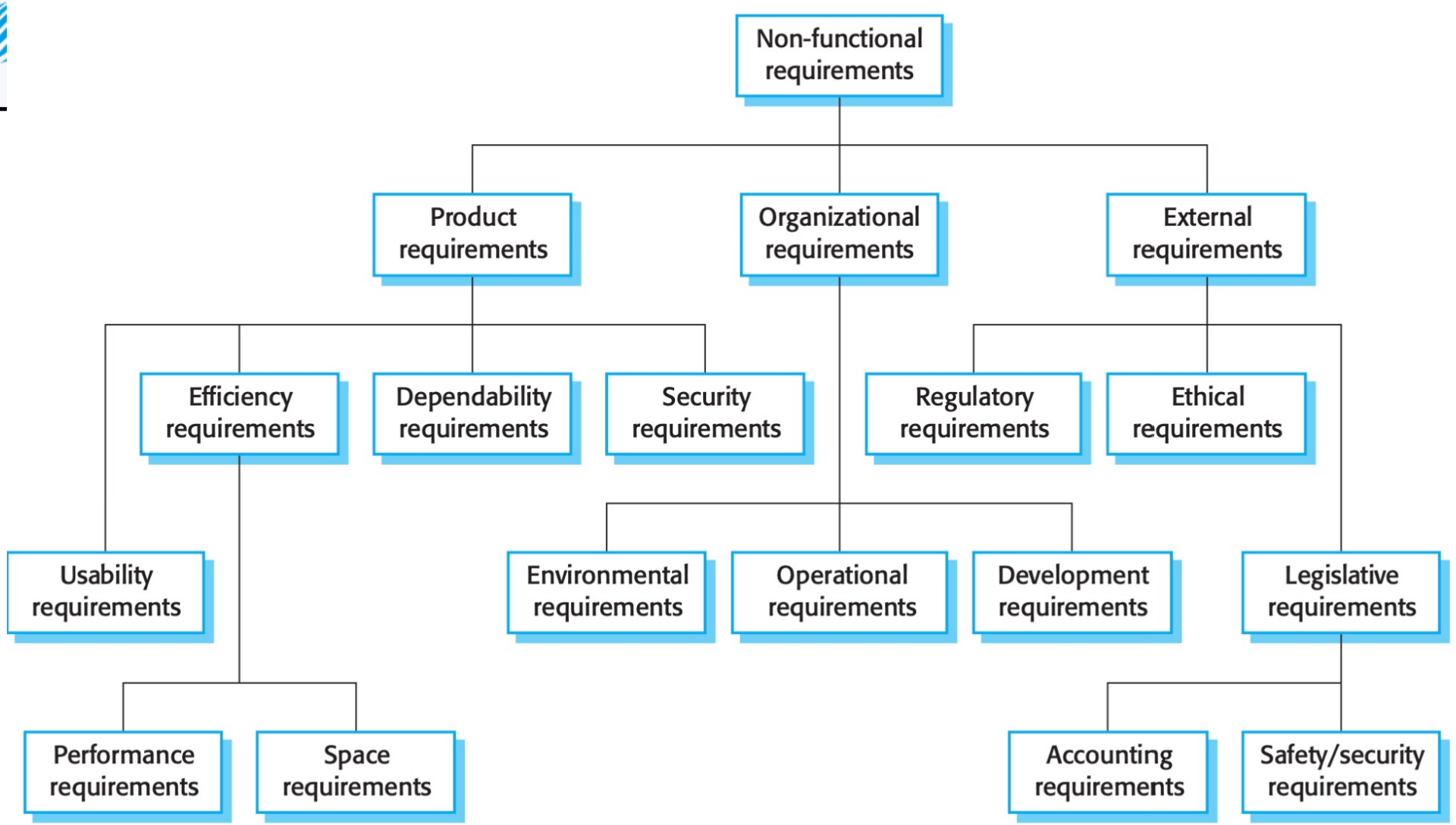
Functional requirements These are statements of services the system should provide, how the system should react to particular inputs, and how the system should behave in particular situations. In some cases, the functional require- ments may also explicitly state what the system should not do.

Non-functional requirements These are constraints on the services or functions offered by the system. They include timing constraints, constraints on the devel- opment process, and constraints imposed by standards. Non-functional require- ments often apply to the system as a whole rather than individual system features or services

Requirements

Functional requirements Example:

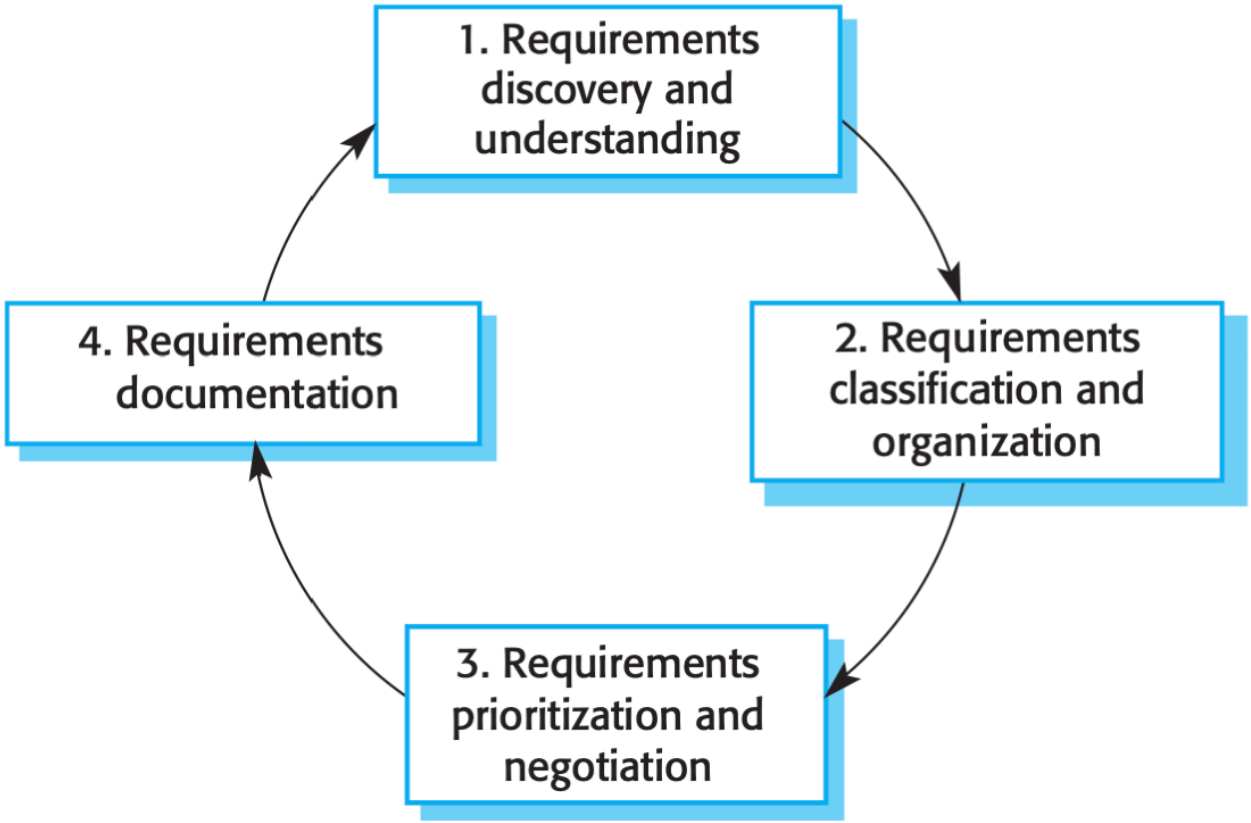
- A user shall be able to search the appointments lists for all clinics.
- The system shall generate each day, for each clinic, a list of patients who are expected to attend appointments that day.
- Each staff member using the system shall be uniquely identified by his or her eight-digit employee number


Non-functional requirements
Product requirements
Organizational requirements
External requirements
Efficiency requirements
Dependability requirements
Security requirements
Regulatory requirements
Ethical requirements
Usability requirements
Environmental requirements
Operational requirements
Development requirements
Legislative requirements
Performance requirements
Space requirements
Accounting requirements
Safety/security requirements

Requirements

Property	Measure
Speed	Processed transactions/second User/event response time Screen refresh time
Size	Megabytes/Number of ROM chips
Ease of use	Training time Number of help frames
Reliability	Mean time to failure Probability of unavailability Rate of failure occurrence Availability
Robustness	Time to restart after failure Percentage of events causing failure Probability of data corruption on failure
Portability	Percentage of target dependent statements Number of target systems

Requirements



Requisitos de Sistema - Classificação

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

During requirements modeling, systems developers must identify and describe all system requirements.

Requisitos de Sistema - Classificação

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- The website must report online volume statistics every four hours, and hourly during peak periods.
- The inventory system must produce a daily report showing the part number, description, quantity on hand, quantity allocated, quantity available, and unit cost of all sorted by part number.
- The contact management system must generate a daily reminder list for all sales reps.
- The purchasing system must provide suppliers with up-to-date specifications.
- The sales tracking system must produce a daily fast-moving-item report, listing all products that exceed the forecasted sales volume grouped by style, color, size, and reorder status.
- The customer analysis system must produce a quarterly report that identifies changes in ordering patterns or trends with statistical comparisons to the previous four quarters.

Requisitos de Sistema - Classificação

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- Manufacturing employees must swipe their ID cards into online data collection terminals that record labor costs and calculate production efficiency.
- The department head must enter overtime hours on a separate screen.
- Student grades must be entered on machine-readable forms prepared by the instructor.
- Each input form must include date, time, product code, customer number, and quantity.
- Data entry screens must be uniform, except for background color, which can be changed by the user.
- A data entry person at the medical group must input patient services into the billing system.

Requisitos de Sistema - Classificação

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- The student records system must calculate the GPA at the end of each semester.
- As the final step in year-end processing, the payroll system must update employee salaries, bonuses, and benefits and produce tax data required by the IRS.
- The warehouse distribution system must analyze daily orders and create a routing pattern for delivery trucks that maximizes efficiency and reduces unneces- sary mileage.
- The human resources system must interface properly with the existing payroll system.
- The equipment rental system must not execute new rental transactions for customers who have overdue accounts.

Requisitos de Sistema - Classificação

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- The system must support 25 users online simultaneously.
- Response time must not exceed four seconds.
- The system must be operational seven days a week, 365 days a year.
- The accounts receivable system must prepare customer statements by the third business day of the following month.
- The student records system must produce class lists within five hours after the end of registration.
- The online inventory control system must flag all low-stock items within one hour after the quantity falls below a predetermined minimum.

Requisitos de Sistema - Classificação

Examples:

- Outputs
- Inputs
- Processes
- Performance
- Controls

- The system must provide logon security at the operating system level and at the application level.
- An employee record must be added, changed, or deleted only by a member of the human resources department.
- The system must maintain separate levels of security for users and the system administrator.
- All transactions must have audit trails.
- The manager of the sales department must approve orders that exceed a customer's credit limit.
- The system must create an error log file that includes the error type, description, and time.

Requisitos de Sistema - Classificação

In addition to the system requirements, systems analysts must consider **scalability,** which determines how a system will handle future growth and demands, and the **total cost of ownership**, which includes all future operational and support costs.

Categories:

- Outputs
- Inputs
- Processes
- Performance
- Controls

Scalability refers to a system's ability to handle increased business volume and trans- actions in the future. Because it will have a longer useful life, a scalable system offers a better return on the initial investment.

In addition to direct costs, systems developers must identify and document indirect expenses that contribute to the **Total Cost of Ownership (TCO)**

Fact-Finding

Whether working solo or as a member of a team, during requirements modeling the analyst will use **various fact-finding techniques, including interviews, document review, observation, surveys and questionnaires, sampling, and research**.

Although software can help gather and analyze facts, no program actually performs fact-finding automatically. First, the information needed must be identified.

Fact-Finding

Typically, this activity begins by asking a series of questions, such as these:

- What business functions are supported by the current system?
- What strategic objectives and business requirements must be supported by the new system?
- What are the benefits and TCO of the proposed system?
- What transactions will the system process?
- What information do users and managers need from the system?
- Must the new system interface with legacy systems?
- What procedures could be eliminated by business process reengineering?
- What security issues exist?
- What risks are acceptable?
- What budget and timetable constraints will affect system development?

Fact-Finding

To obtain answers to these questions, the analyst develops a fact-finding plan, which can involve another series of questions (who, what, where, when, and how), or use a more structured approach.

Fact-Finding

- ***Who?*** Who performs each of the procedures within the system? Why? Are the correct people performing the activity? Could other people perform the tasks more effectively?
- ***What?*** What is being done? What procedures are being followed? Why is that process necessary? Often, procedures are followed for many years and no one knows why. Question why a procedure is being followed at all.
- ***Where?*** Where are operations being performed? Why? Where could they be performed? Could they be performed more efficiently elsewhere?
- ***When?*** When is a procedure performed? Why is it being performed at this time? Is this the best time?
- ***How?*** How is a procedure performed? Why is it performed in that manner? Could it be performed better, more efficiently, or less expensively in some other manner?

Fact-Finding

There is a difference between asking what is being done and what could or should be done. **The systems analyst first must understand the current situation**.

CURRENT SYSTEM		PROPOSED SYSTEM
Who does it?	Why does this person do it?	Who should do it?
What is done?	Why is it done?	What should be done?
Where is it done?	Why is it done there?	Where should it be done?
When is it done?	Why is it done then?	When should it be done?
How is it done?	Why is it done this way?	How should it be done?

Fact-Finding - Tools

Interviews

Document Review

Observation

Questionnaires and Surveys

Brainstorming

Sampling

Research

Interviews

An **interview** is a planned meeting during which the analyst obtains information from another person. The skills needed to plan, conduct, document, and evaluate interviews successfully must be understood.

Interviews

1. Determine the people to interview.
2. Establish objectives for the interview.
3. Develop interview
4. Prepare for the interview.
5. Conduct the interview.
6. Document the interview.
7. Evaluate the interview.

Fact-Finding - Tools

Interviews

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To get an accurate picture, the analyst must select the right people to interview and ask them the right questions .

The preliminary investigation involved mainly middle managers or department heads. Now, **during the systems analysis phase, people from all levels of the organization should be interviewed**

- **Individual or Group Interviews;**
  - **Opportunity to observe interaction but …..**
  - **One person might dominate the conversation, or …**
  - **might prevent lower-level employees from expressing themselves**
- **Formal and Informal Structures;**

Fact-Finding - Tools

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First, the general areas to be discussed should be determined, and then the facts to be gathered should be listed. Soliciting ideas, suggestions, and opinions during the interview is also a good idea.

Distinct Roles => Distinct Objectives

Upper-level managers can provide the big picture to help understand the system as a whole. Specific details about operations and business processes are best learned from people who actually work with the system on a daily basis.

Early stages of systems analysis, interviews usually are general. As the fact-finding process continues, however, the interviews focus more on specific topics

Fact-Finding - Tools

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Creating a **standard list of interview questions** helps to keep the session on track and avoid unnecessary tangents. Also, if several people who perform the same job are interviewed, a standard question list **permits a comparison of their answers**.

The interview should consist of **several different kinds of questions**: open-ended, closed-ended, or questions with a range of responses. When phrasing questions, avoid leading questions that suggest or favor a particular reply. For example, rather than asking, "**What advantages do you see in the proposed system?"** ask instead, "**Do you see any advantages in the proposed system**?"

Fact-Finding - Tools

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Open-ended questions:

Encourage spontaneous and unstructured responses. Such questions are useful to understand a larger process or draw out the interviewee's opinions, attitudes, or suggestions

- What are users saying about the new system?
- How is this task performed?
- Why do you perform the task that way?
- How are the checks reconciled?
- What added features would you like to have in the new billing system?
- Is there any- thing else you can tell me about this topic?

Fact-Finding - Tools

Interviews

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Closed-ended questions:

Limit or restrict the response. Closed- ended questions are used when information that is more specific is needed, or when facts must be verified.

- How many personal computers do you have in this department?
- Do you review the reports before they are sent out?
- How many hours of training does a clerk receive?
- Is the calculation procedure described in the manual?
- How many customers ordered products from the website last month?

Fact-Finding - Tools

Interviews

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Range-of-Response questions:

Are closed-ended questions that ask the person to evaluate something by providing limited answers to specific responses or on a numeric scale. This method makes it easier to tabulate the answers and interpret the results.

- On a scale of 1 to 10, with 1 the lowest and 10 the highest, how effective was your training?
- How would you rate the severity of the problem: low, medium, or high?
- Is the system shutdown something that occurs never, sometimes, often, usually, or always?

Fact-Finding - Tools

Interviews

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After setting the objectives and developing the questions, preparing for the interview is next. Careful preparation is essential because an **interview is an important meeting and not just a casual chat**.

A **list of topics should be sent to an interviewee several days before** the meeting, especially when detailed information is needed, so the person can prepare for the interview and minimize the need for a follow-up meeting.

If there are questions about documents, ask the interviewee to have samples available at the meeting. The **advance memo should include a list of the documents to discuss** (if it is known what they are)

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Two schools of thought exist about the best location for an interview. Some analysts believe that interviews **should take place in the interviewee's office**, whereas other analysts feel that a **neutral location such as a conference room** is better.

Some believe Office is the best location because it makes the interviewee feel comfortable during the meeting. A second argument in favor of the interviewee's office is that the office is where he or she has the easiest access to supporting material that might be needed during the discussion

Supporters of neutral locations stress the importance of keeping interruptions to a minimum so both people can concentrate fully. In addition, an interview that is free of interruptions takes less time

Fact-Finding - Tools

Interviews

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When conducting an interview, begin with introductions, describe the project, and explain the interview objectives.

During the interview, ask questions in the order in which they were prepared, and give the interviewee sufficient time to provide thoughtful answers. Some answers will lead to additional questions, which should be asked in a logical order.

Analysts sometimes hear only what they expect to hear. Concentrate on what is said and notice any nonverbal communication that takes place. This process is called **engaged listening**.

When all the questions have been asked, summarize the main points covered in the interview and explain the next course of action.

Fact-Finding - Tools

Interviews

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Although taking notes during an interview has both advantages and disadvantages, **it should be kept to a minimum**. It is a good idea to write down a few notes to remember key points after the interview, but avoid writing down everything that is said. Too much writing distracts the other person and makes it harder to establish a good rapport.

After the meeting, **a memo should be sent to the interviewee, expressing appreciation** for his or her time and cooperation. In the memo, note the date, time, location, purpose of the interview, and the main points discussed, so the interviewee has a writ- ten summary and can offer additions or corrections.

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In addition to recording the facts obtained in an interview, try to identify any possible biases. For example, **an interviewee who tries to protect his or her own area or function might give incomplete answers** or refrain from volunteering information.

Or, an interviewee with **strong opinions about the current or future system might distort the facts**. Some interviewees might answer questions in an attempt to be helpful even though they do not have the necessary experience to provide accurate information.

Document Review

It can **help the analyst understand how the current system is supposed to work**. Remember that system documentation sometimes is out of date. Forms can change or be discontinued, and documented procedures often are modified or eliminated. It is prudent to **obtain copies of actual forms and operating documents currently in use**, and to review blank copies of forms, as well as samples of actual completed forms. **Document samples can be obtained during interviews with the people who perform that procedure.**

Observation

Seeing the system in action provides additional perspective and a better understanding of system procedures. Personal observation also allows the analyst to verify statements made in interviews and determine whether procedures really operate as they are described.

Recommendations often are better accepted when they are based on personal observation of actual operations. Observation can also **provide the knowledge needed to test or install future changes** and can help build relationships with the users who will work with the new system.

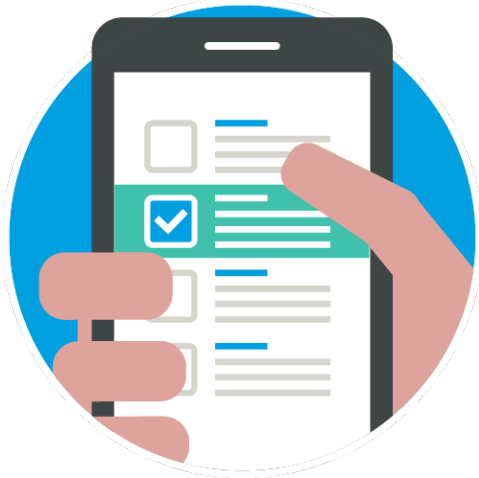
Observation – Plan in Advance

- **Observe all the steps in a transaction** and note the documents, inputs, outputs, and processes involved.
- **Examine each form, record, and report**. Determine the purpose each item of information serves.
- **Consider each user who works with the system** and the following questions: What information does that person receive from other people? What information does this person generate? How is the information communicated? How often do interruptions occur? How much downtime occurs? How much sup- port does the user require, and who provides it?
- **Talk to the people** who receive current reports to see whether the reports are complete, timely, accurate, and in a useful form. Ask whether information can be eliminated or improved and whether people would like to receive additional information.

Questionnaries and surveys

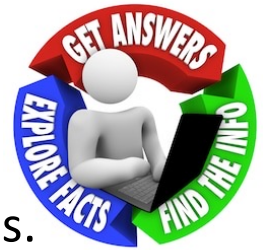
In projects where it is **desirable to obtain input from a large number of people**, a questionnaire can be a valuable tool. A questionnaire, also called a survey, is a document containing a number of standard questions that can be sent to many individuals.

Questionnaires can be used to obtain information about a wide range of topics, including workloads, reports received, volumes of transactions handled, job duties, difficulties, and opinions of how the job could be performed better or more efficiently.

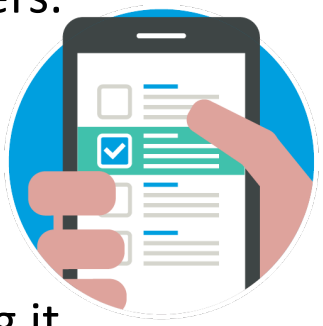


Questionnaries and surveys – How to design

When designing a questionnaire, the most important rule of all is to make sure that the questions collect the right data in a form that can be used:



- **Keep the questionnaire brief** and user-friendly.
- **Provide clear instructions** that will answer all anticipated questions.
- Arrange the **questions in a logical order**, going from simple to more complex topics.
- **Phrase questions to avoid misunderstandings**; use simple terms and wording.
- Try **not to lead the response** or use questions that give clues to expected answers.
- **Limit the use of open-ended** questions that are difficult to tabulate.
- **Limit the use of questions that can raise concerns** about job security or other negative issues.
- Include a section at the end of the questionnaire for **general comments**.
- **Test the questionnaire** whenever possible on a small test group before finalizing it and distributing to a large group.

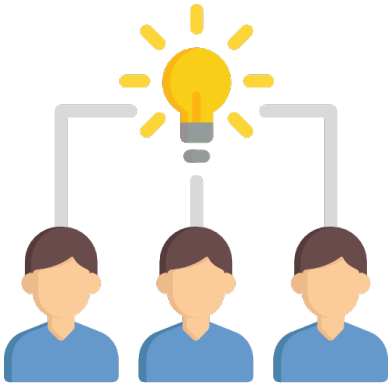


Brainstorming

Another popular method of obtaining input is called brainstorming, which refers to a **small group discussion of a specific problem**, opportunity, or issue. This technique encourages new ideas, allows team participation, and enables participants to build on each other's inputs and thoughts. Brainstorming can be **structured** or **unstructured**.

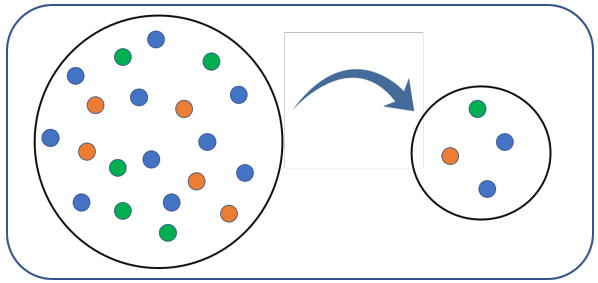
In structured brainstorming, each participant speaks when it is his or her turn, or passes.

In unstructured brainstorming, anyone can speak at any time. At some point, the results are recorded and made part of the fact-finding documentation process.



Sampling

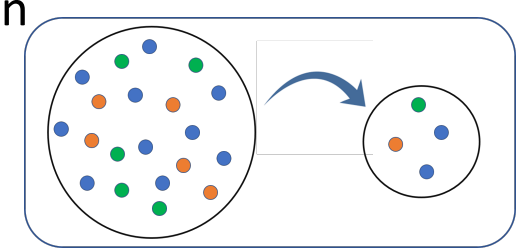
When studying an information system, examples of actual documents should be collected using a process called sampling. **The samples might include records, reports, operational logs, data entry documents, complaint summaries, work requests, and various types of forms**. Sampling techniques include systematic sampling, stratified sampling, and random sampling.



Sampling

Suppose there is a list of 200 customers who complained about errors in their statements, and a representative sample of 20 customers will be reviewed.

A **systematic sample** would select every tenth customer for review.
To ensure that the sample is balanced geographically, however, a **stratified sample** could be used to select five customers from each of four postal codes. Another example of stratified sampling is to select a certain percentage of transactions from each postal code, rather than a fixed number.
Finally, a **random sample** selects any 20 customers.

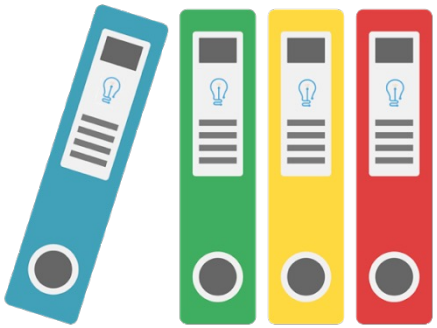


Research

Research is another important fact-finding technique. Research can **include the Internet, IT magazines, and books to obtain background information, technical material, and news about industry trends and developments**.

In addition, attending professional meetings, seminars, and discussions with other IT professionals can be very helpful in problem solving.

Documentation



As information is gathered, the importance of a single item can be overlooked or complex system details can be forgotten. The basic rule is to write it down. An analyst should document their work according to the following principles:

- **Record information as soon as it is obtained.**
- **Use the simplest recording method possible.**
- **Record findings in such a way that someone else can understand them.**
- **Organize documentation so related material is located easily.**