Information Systems Design

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Questions

- **What is the purpose** of Information and Communication Technology (ICT) in an organization?
- Is it enough **to buy** ICT or is it necessary **to manage** ICT in an organization?
- What consequences does the use of ICT have in an organization?
- Does IT matter?
- How is an information system designed?

Goals of the course

To provide basic knowledge on

- Information System types
- Structural and architectural concepts of Information Systems
- Modeling tools and methods in IS design
- Strategic relevance of IT

Design an Information system yourself

Lectures schedule

- 22/2 Introduction to Management Information Systems
- 24/2 Information systems and organizations
- 1/3   Information systems characteristics
- 3/3   A taxonomy of information systems
- 8/3   UML software lab
- 10/3 UML software lab
- 15/3 UML software lab
- 17/3 Information systems types

Lectures schedule

- 22/3 IS planning
- 24/3 IS planning
- 29/3 IS planning
- 31/3 ERP systems for information management
- 12/4 ERP life cycle
- 14/4 ERP Critical success factors

- Prova intermedia (23/4?)

Lectures schedule

- Design an information system:
  - From the requirements analysis to processes design
  - Mandatory presence to lectures in info lab

- 5/5   Case presentation
- 10/5   Case study
- 12/5   Case study
- 17/5   Case study

- 7/6   Case study HANDOUT

Course schedule

- 19/5 Software Project management
- 24/5 Software Project management
- 26/5 IS strategies
- 31/5 Introduction to Service Oriented Architectures

JUNE ??: PROVA FINALE

Grading

- 40% project work and course work
- 60% final exam
- Project work: groups of 3 students max

Topic coverage

- Slides on the LIUC website
- Books
  - Fowler, Scott, UML distilled, Addison Wesley
  - Scott, *UML explained*, Addison Wesley
  - Pigni F., Ravarini A., Sciuto D., *Sistemi per la gestione dell'informazione*, Apogeo, nuova versione 2009
  - K. Laudon, J. Laudon, Management Information Systems, Prentice Hall
  - Turban, McLean, Wetherbe, Information technology for Management, Wiley

Does IT Matter?

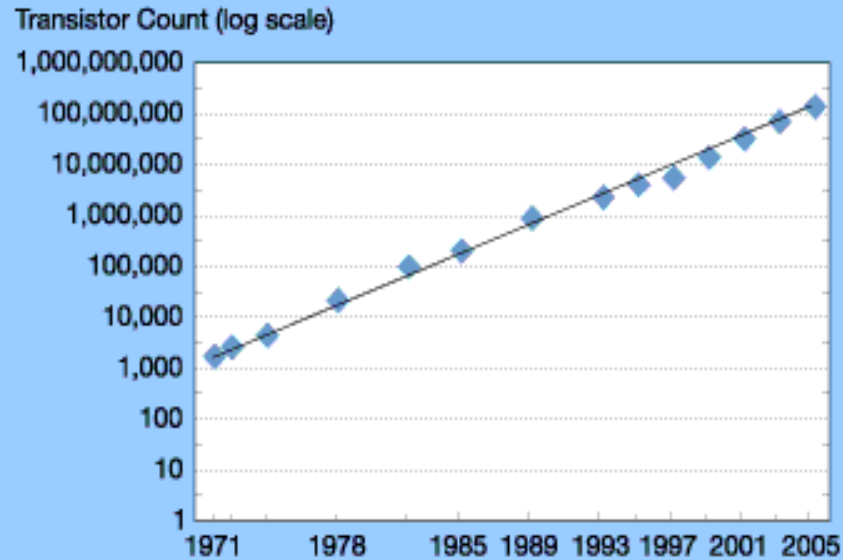adapted from Gabriele Piccoli, Cornell University, USA

IT
Doesn't
Matter

by Nicholas G. Carr

As *information technology's power* and ubiquity have grown, *its strategic importance* has diminished. The way you approach *IT investment and management* will need to change dramatically.
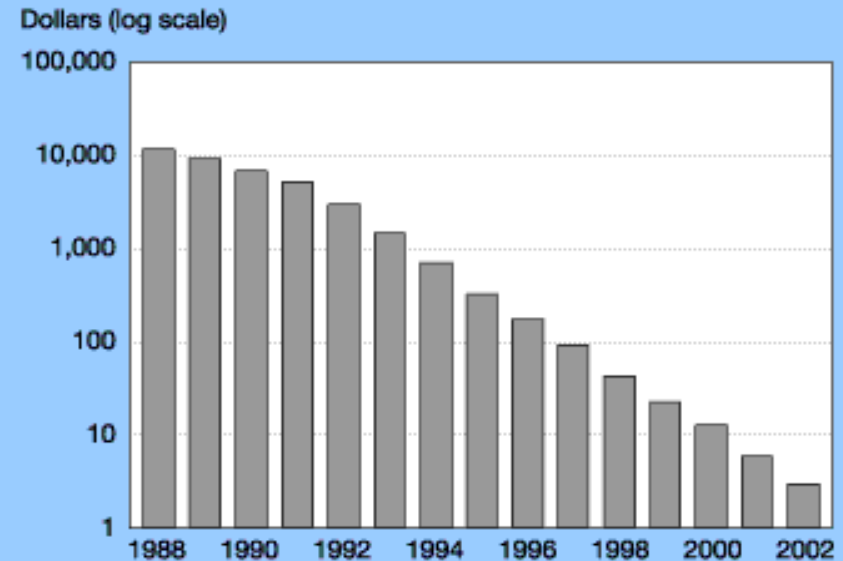
The "power" of computers

Figure 8-1.
Moore's Law: 1971–2005

Transistor Count (log scale)

NOTES: The line on the graph represents the trend that defines Moore's Law. The data points reflect actual (1971–2001) and projected (2003–2005) data.

See appendix table 8-1.   *Science & Engineering Indicators – 2002*

Figure 8-2.
Cost per gigabyte of stored information: 1988–2002

Dollars (log scale)

NOTES: 2001 and 2002 data are projected.

SOURCE: P. Lyman and H. R. Varian. 2000. "How Much Information?" Available at <http://www.sims.berkeley.edu/how-much-info/>. Accessed July 2, 2001.

Science & Engineering Indicators – 2002

Comparing IT with other infrastructural technologies

technology

1. Steam power
2. Electricity
3. Electronics

devices
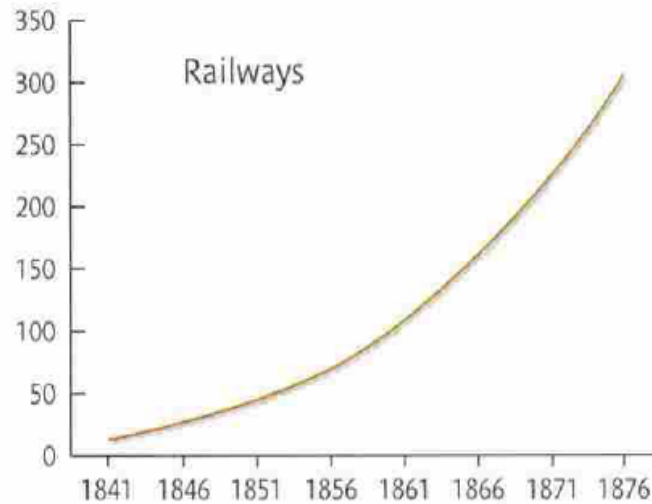
1. Locomotive
2. Lamp
3. Computer

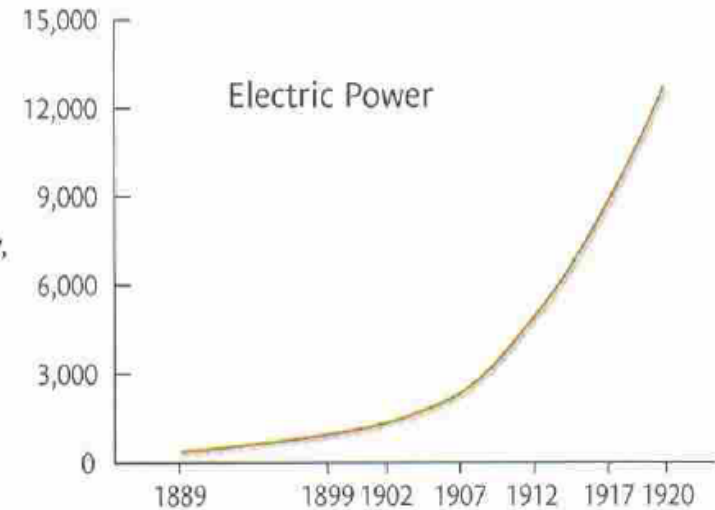**networks**

1. Railroads
2. Electric network
3. Internet

.. by definition the value of an infrastructural technolgy lies in the sharing of the technology, thus the first company that adopts it takes upon itself the related risk ..
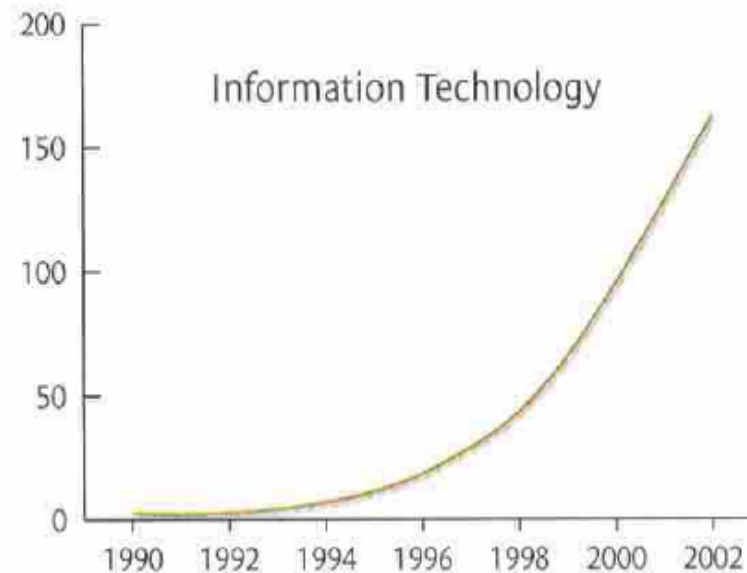
The sprint to commoditization

IT Doesn't Matter: New Rules
spend less

New Rules for IT Management

With the opportunities for gaining strategic advantage from information technology rapidly disappearing, many companies will want to take a hard look at how they invest in IT and manage their systems. As a starting point, here are three guidelines for the future:

Spend less. Studies show that the companies with the biggest IT investments rarely post the best financial results. As the commoditization of IT continues, the penalties for wasteful spending will only grow larger. It is getting much harder to achieve a competitive advantage through an IT investment, but it is getting much easier to put your business at a cost disadvantage.

Nicholas Carr, Former Editor, Harvard Business Review

IT Doesn't Matter: New Rules
follow, don't lead

> Follow, don't lead. Moore's Law guarantees that the longer you wait to make an IT purchase, the more you'll get for your money. And waiting will decrease your risk of buying something technologically flawed or doomed to rapid obsolescence. In some cases, being on the cutting edge makes sense. But those cases are becoming rarer and rarer as IT capabilities become more homogenized.

Nicholas Carr, *Former Editor, Harvard Business Review*

IT Doesn't Matter: New Rules
focus on vulnerabilities, not opportunities

Focus on vulnerabilities, not opportunities. It's unusual for a company to gain a competitive advantage through the distinctive use of a mature infrastructural technology, but even a brief disruption in the availability of the technology can be devastating. As corporations continue to cede control over their IT applications and networks to vendors and other third parties, the threats they face will proliferate. They need to prepare themselves for technical glitches, outages, and security breaches, shifting their attention from opportunities to vulnerabilities.

Nicholas Carr, Former Editor, Harvard Business Review

Is it true? Does IT matter?

- Carr states that IT is diminishing as a source of strategic differentiation.

- Lesson learned: IT by itself rarely confers strategic differentiation but....

    - IT is inherently strategic because of its indirect effect: it creates possibilities and options that did not exist before

- IT may become ubiquitous but the insight required to harness its potential will not be so evenly distributed

Three lessons on IT

- Extracting value from IT requires innovation in business practice
- IT's economical impact comes from incremental innovation rather than "big bang" initiatives
- The strategic impact of IT investments comes from the cumulative effect of sustained initiatives to innovate business practices in the near term

More information on this topic

- Carr's paper:
  http://www.roughtype.com/archives/2007/01/it_doesnt_matte.php

- A discussion:
  http://www.johnseelybrown.com/Web_Letters.pdf

- An Italian answer
  http://www.cefriel.it/images/CEFRIEL/Pubblicazioni/InnoVision/InnovisionPDF/I_ITMatters_October08.pdf

.. so ..

- .. what is "IT" about?
- .. is "IT" what should matter?
- .. any other questions?

- we need to build a common ground of definitions

Information systems definitions?

Examples of information requirements

- A **seller** wants to know the list of customers he/she did not meet during the last month and the products these customers have already purchased in order to plan next week's meetings and to know which products to propose.

- The manager of the **marketing area** wants to know the list of customers who have already purchased the product "X" in order to offer them a new device for that product.
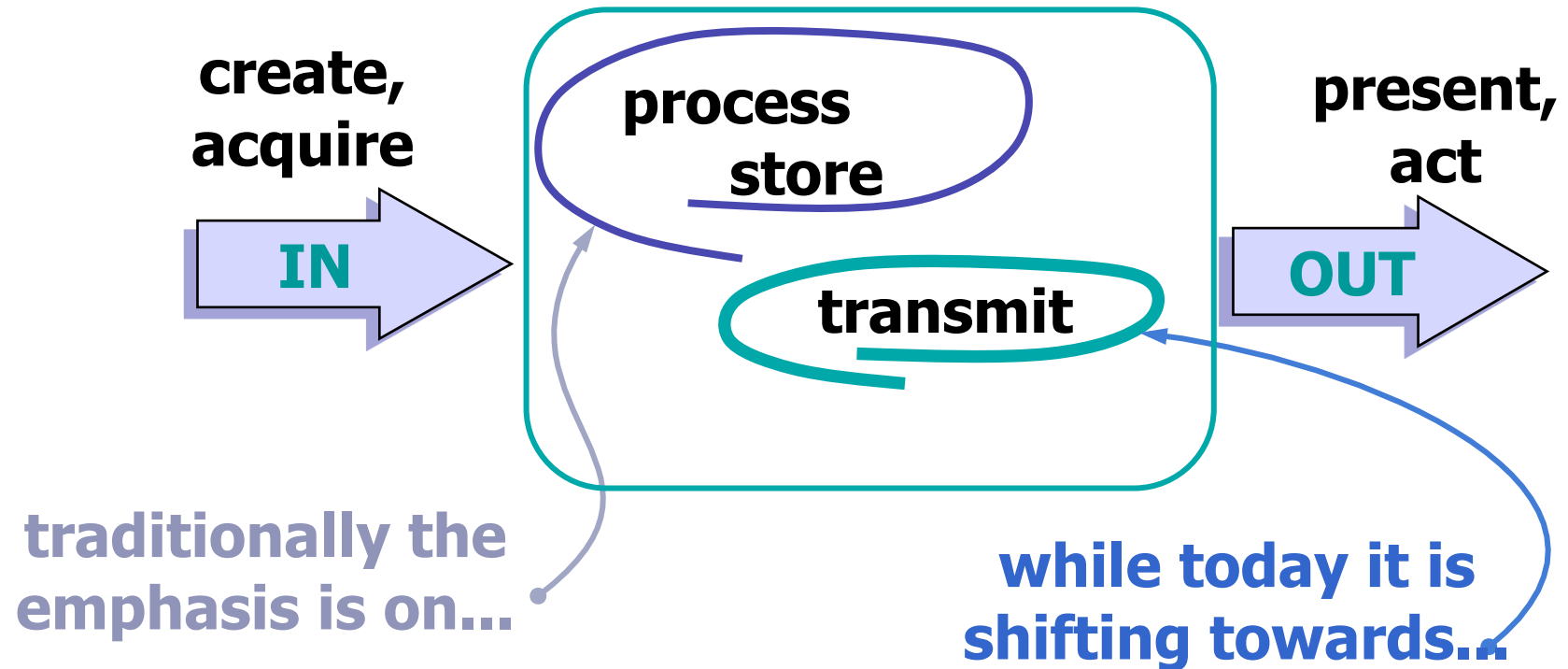
Examples of information requirements

- The **Human Resource Manager** wants to know if there is anyone working in the branch office in Milan who owns the specific competencies required to become the CEO of a new branch office in Rome. Moreover, he/she would like to know if the candidates are willing to move to the new site.

- The manager of a **bank branch** wants to know the list of insolvent customers in order to support the management of new loan requests.
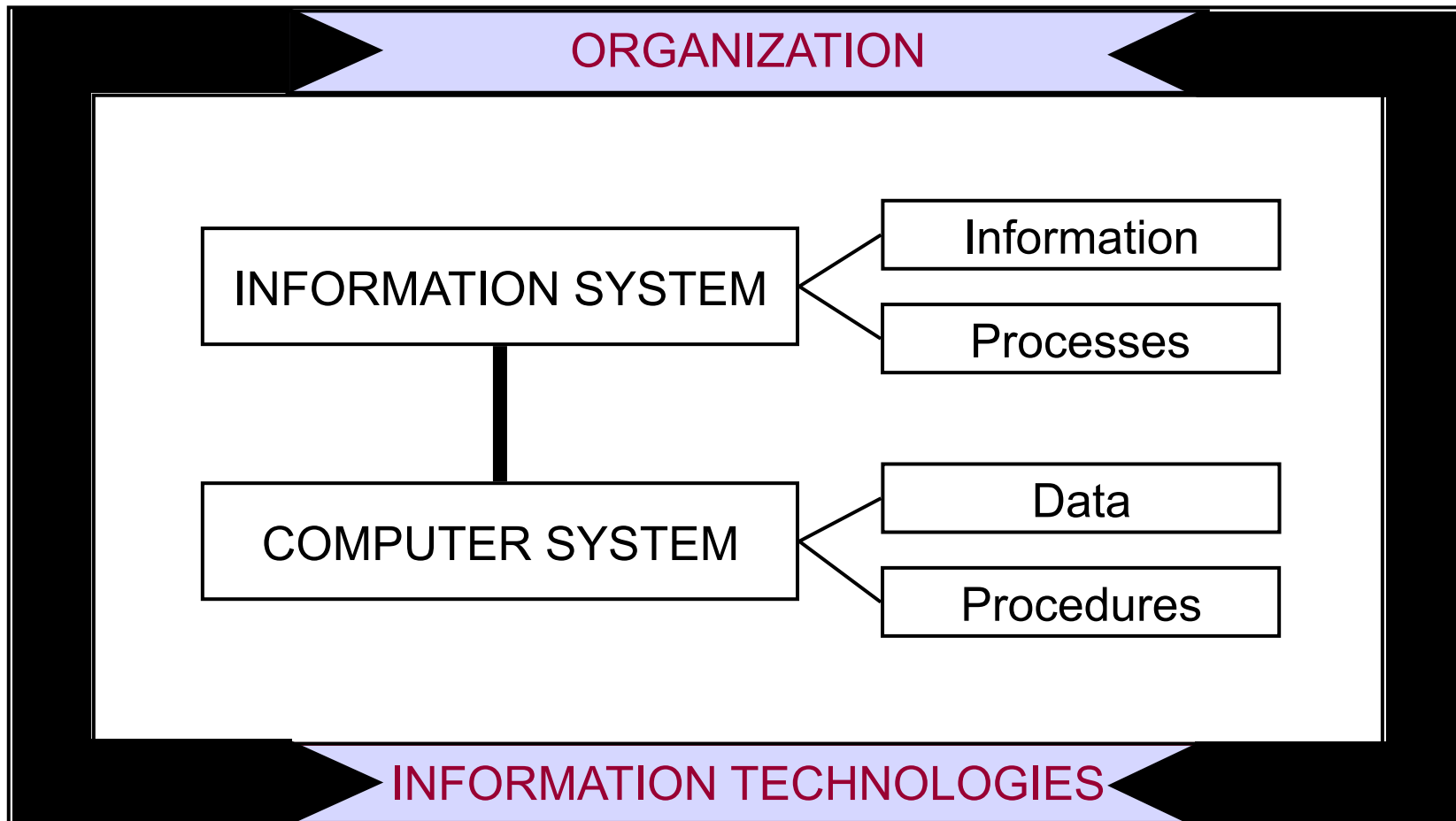
our perspective on Information

- Every **organization** performs its activities basing on a specific set of **resources:**
  - People
  - Money
  - Material
  - Information
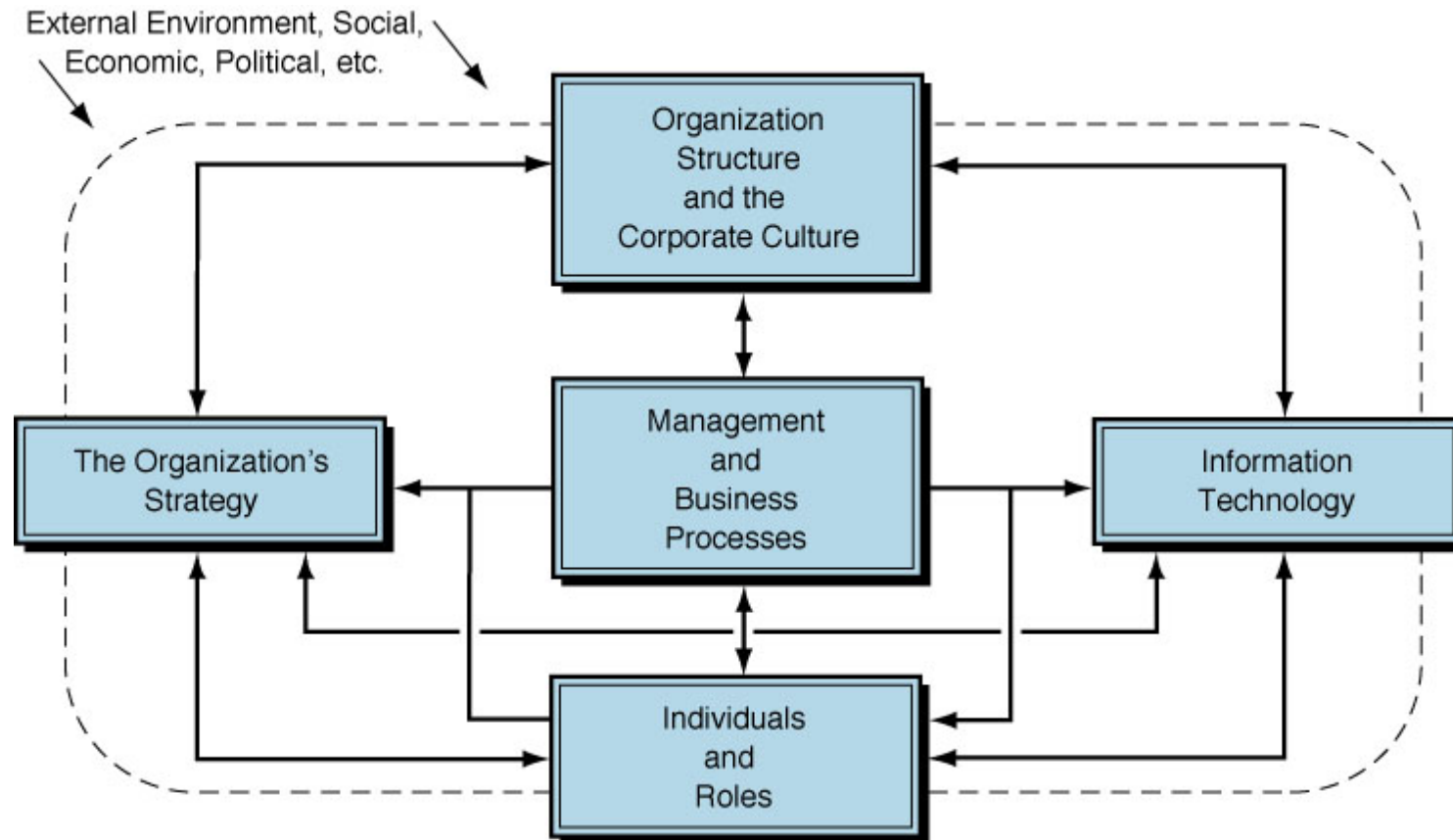
Information Management

create,
acquire

IN

process
store

transmit

present,
act

OUT

traditionally the
emphasis is on...

while today it is
shifting towards...

Context

Relations

External Environment, Social, Economic, Political, etc.

Organization Structure and the Corporate Culture

The Organization's Strategy

Management and Business Processes

Information Technology

Individuals and Roles

Management

- How can organizations recognize the opportunities to use information and telecommunication technology and web-based systems?
- How important is ICT in an organization?
  - In some sectors information technology is the only approach which enables an organization to carry out or improve its activities
- Who manages technology?
- Who manages the business information flow?
- How much technology is necessary?
  - Technology is not free, but sometimes its absence can be much more expensive

How to better compete
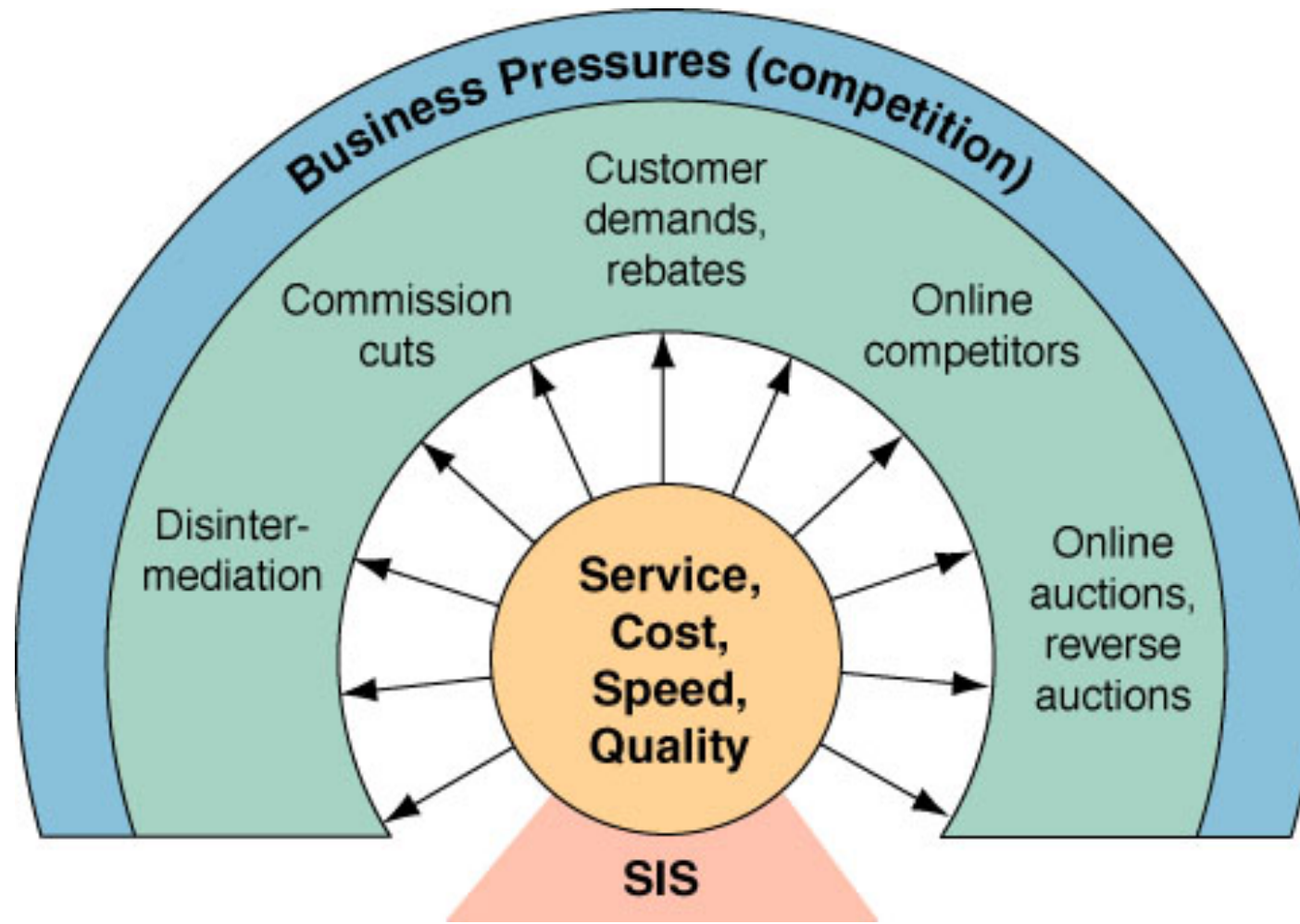
Organizational role of information

- Information - object not only of operation/ production processes, but also of managerial processes.

- Organizational role of information:

    Information Processing Capacity – "adequacy of an organization to meet the needs for information processing required by objectives and context".

    (concepts of efficiency and effectiveness)

Efficiency and Effectiveness (1)

Expected Output

Input

Production System
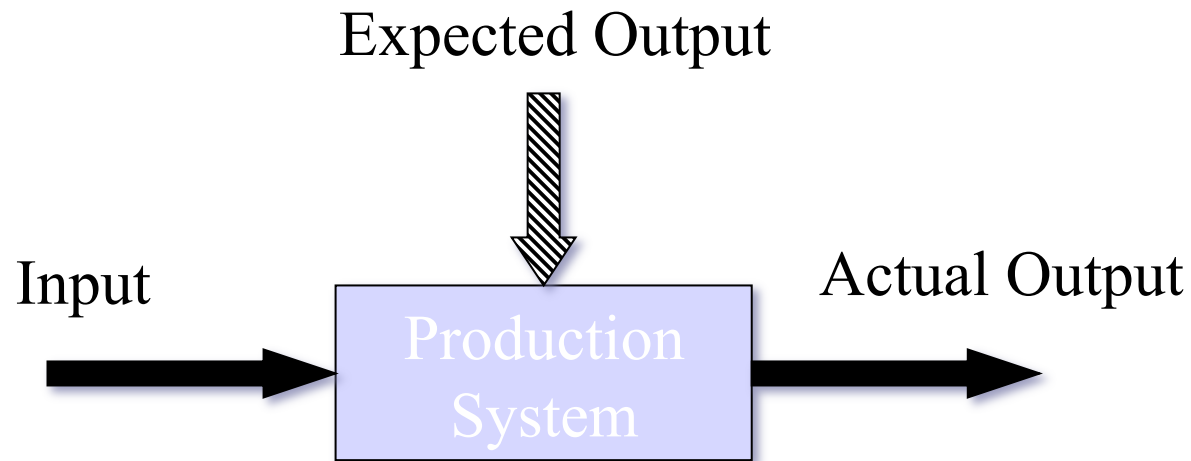
Actual Output

$$Efficiency = \frac{\text{Actual Output}}{\text{Input}} \qquad Effectiveness = \frac{\text{Actual Output}}{\text{Expected Output}}$$

Efficiency and Effectiveness (2)

- Technological innovation has a positive influence on organizational efficiency (i.e. reduction of production time and costs).

- Technological innovation has an indirect influence on organizational effectiveness (i.e. improvement of strategic planning and increased competitiveness).

Information Systems and IT

IT supports information life cycle

IT includes Information Systems

organizational knowledge, technical skills, technical requirements of work having information as its object. IT influences the choice of machines and methods which constitute the technological system

Technological System

Computer System

a specific combination of machines and methods employed in the production of a specific outcome

Information ... Management

- Information is used to decide how to allocate resources to reach business goals

- Processes must be defined for information gathering in order to plan, organize, control business activities

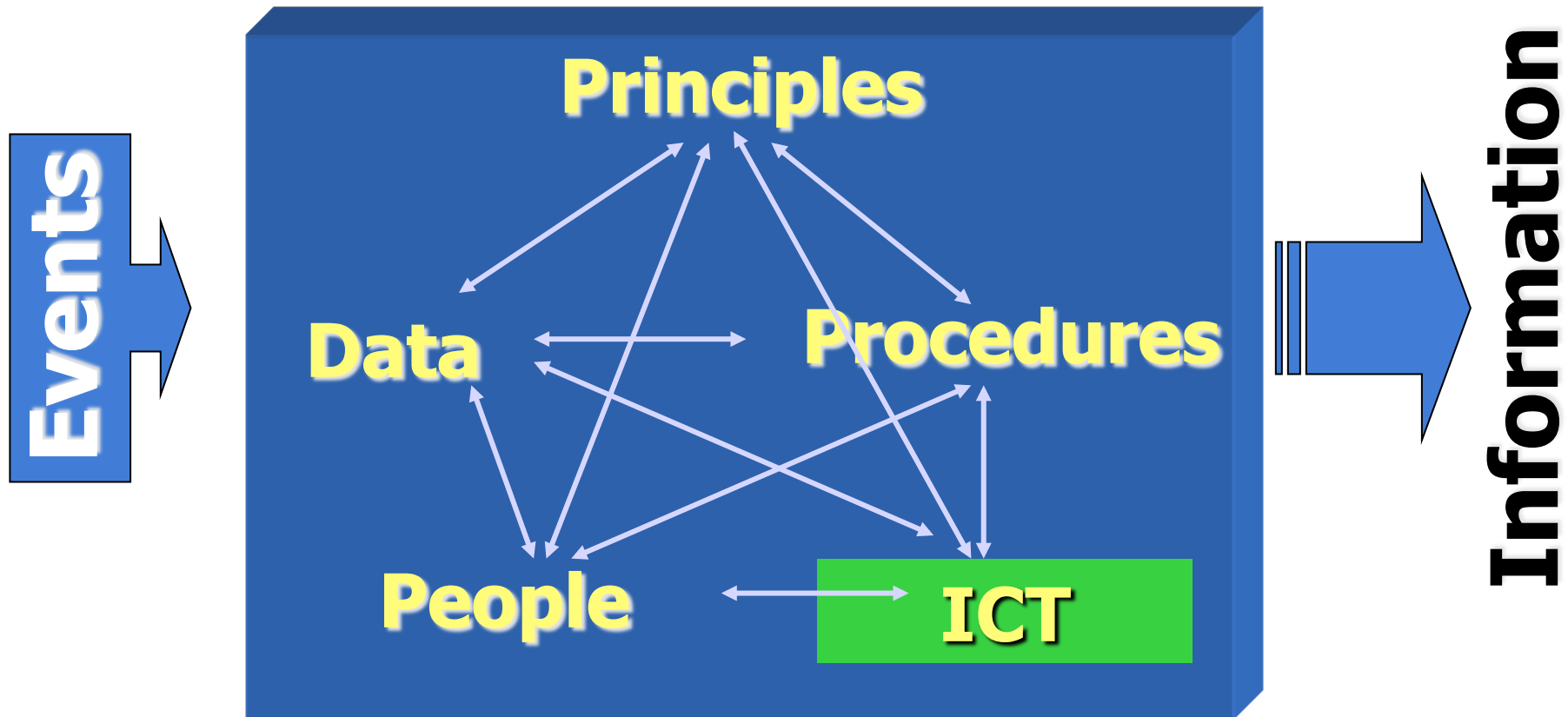- Information is used to measure activity performance

Information systems: definitions (1)

- The whole of the elements aimed at creating, gathering, processing, storing and distributing information with proper times and methods
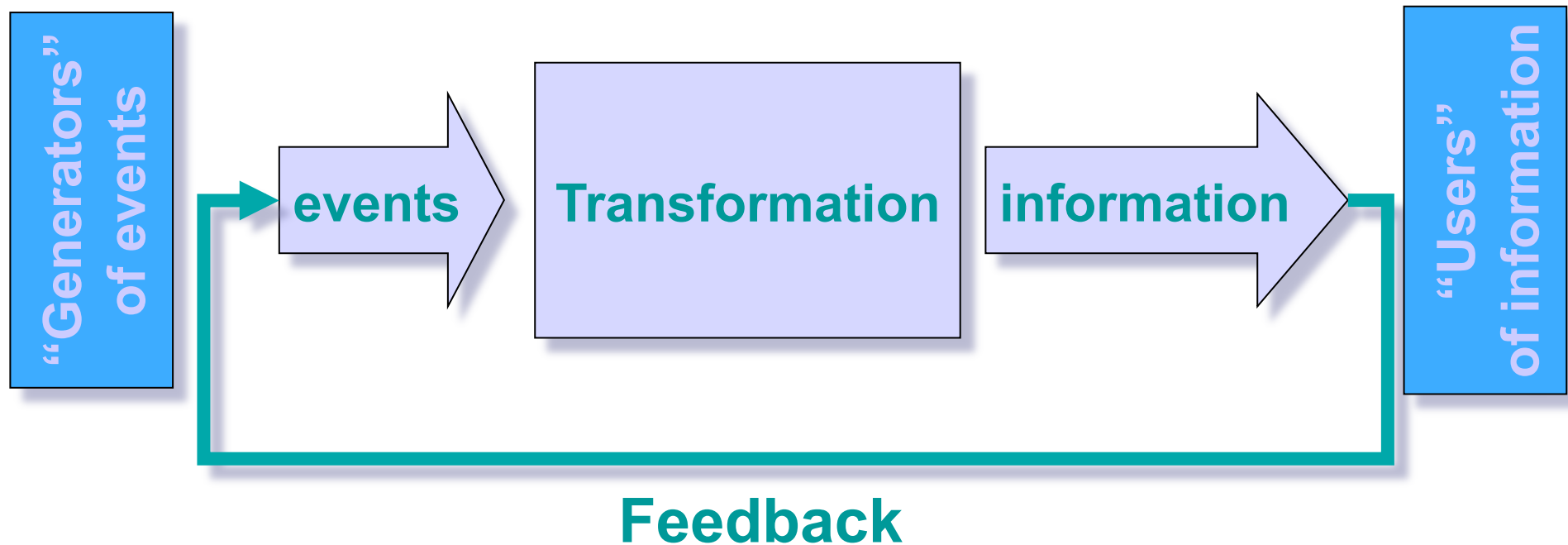

Transfer

Processing   Control   Storage
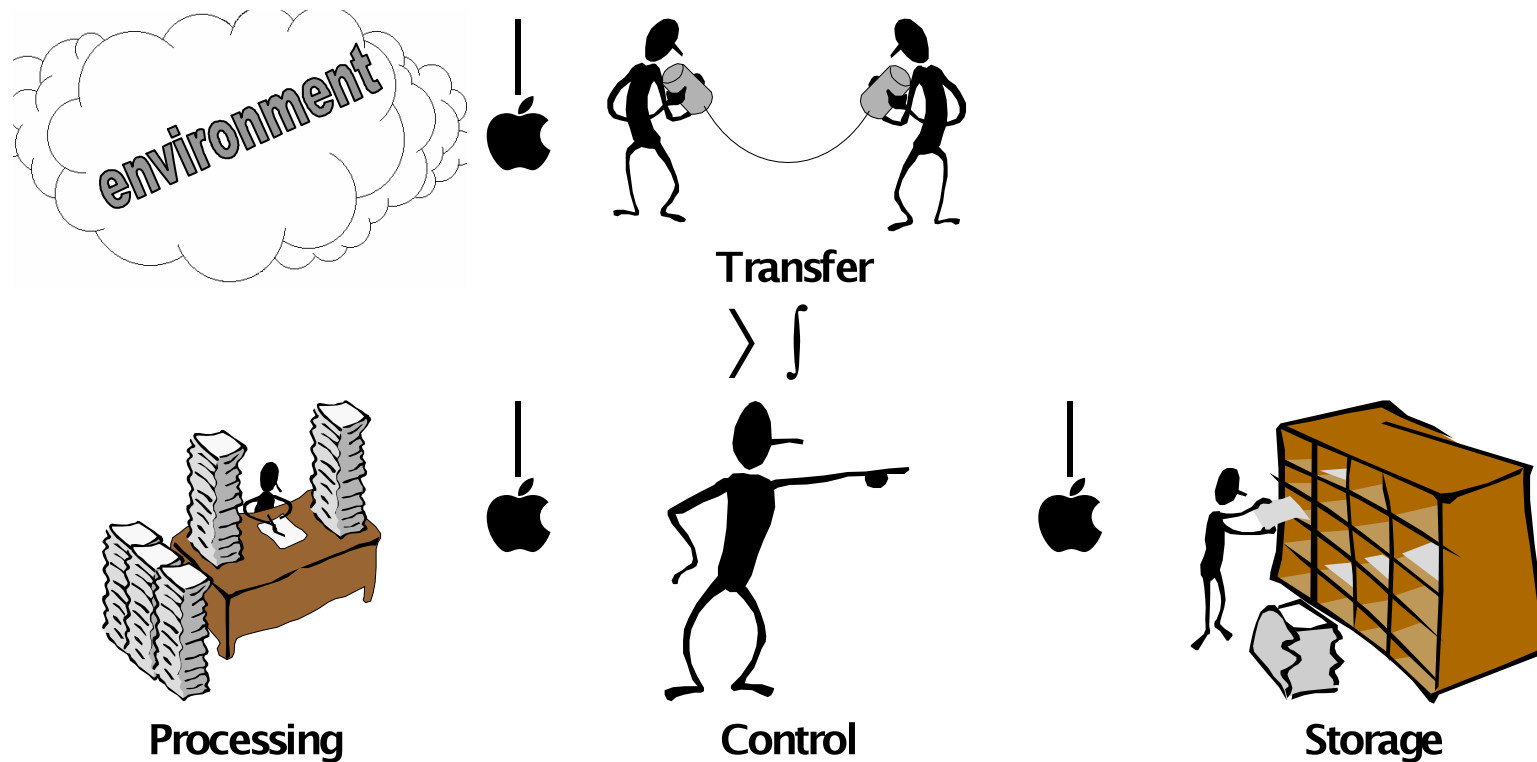
Information Systems: definitions (2)

- The **elements** of an IS

- The "weight" of technology

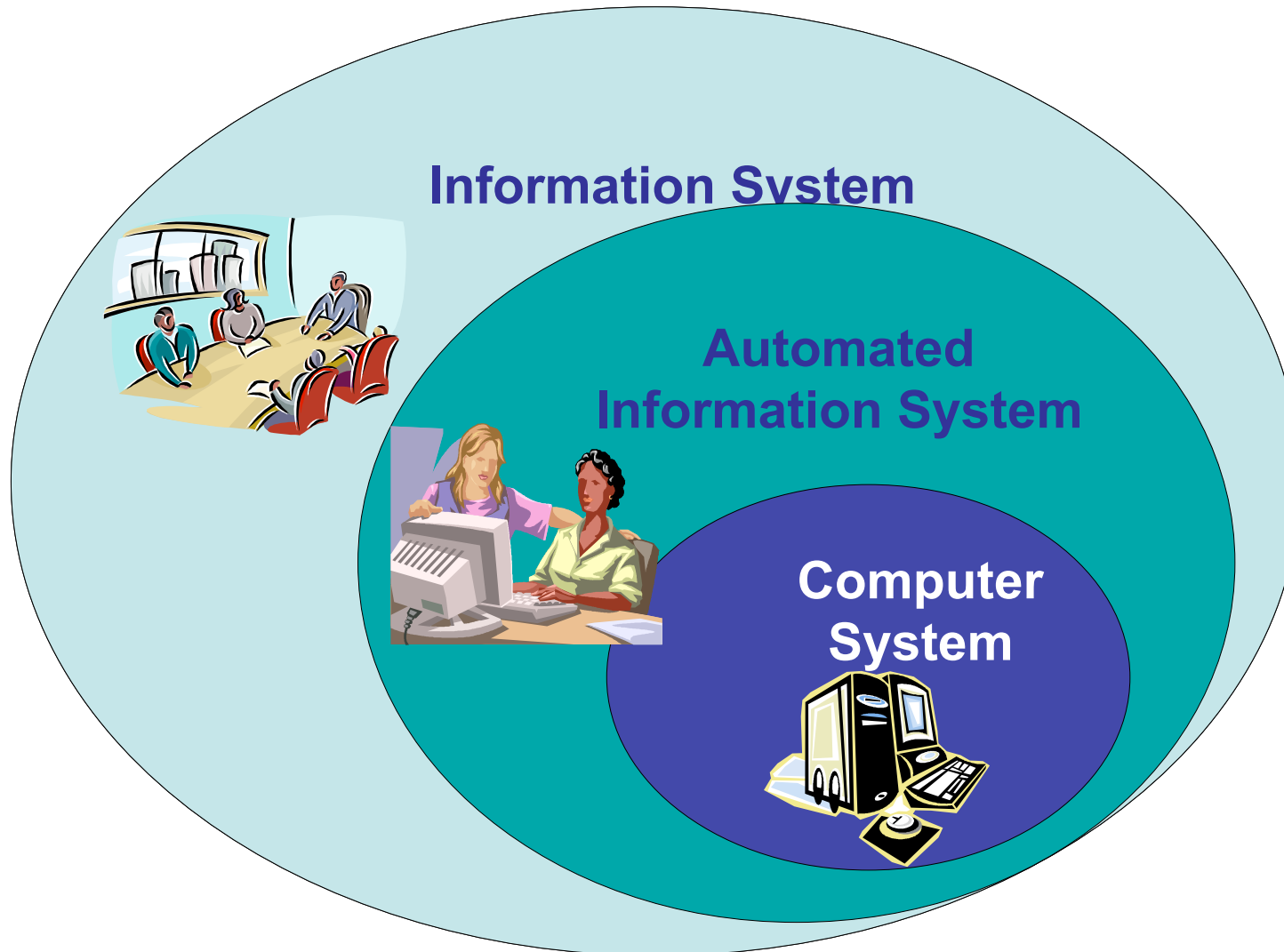# The Information System as "system"

"Generators" of events

events

Transformation

information

"Users" of information

Feedback

The Information System: elements
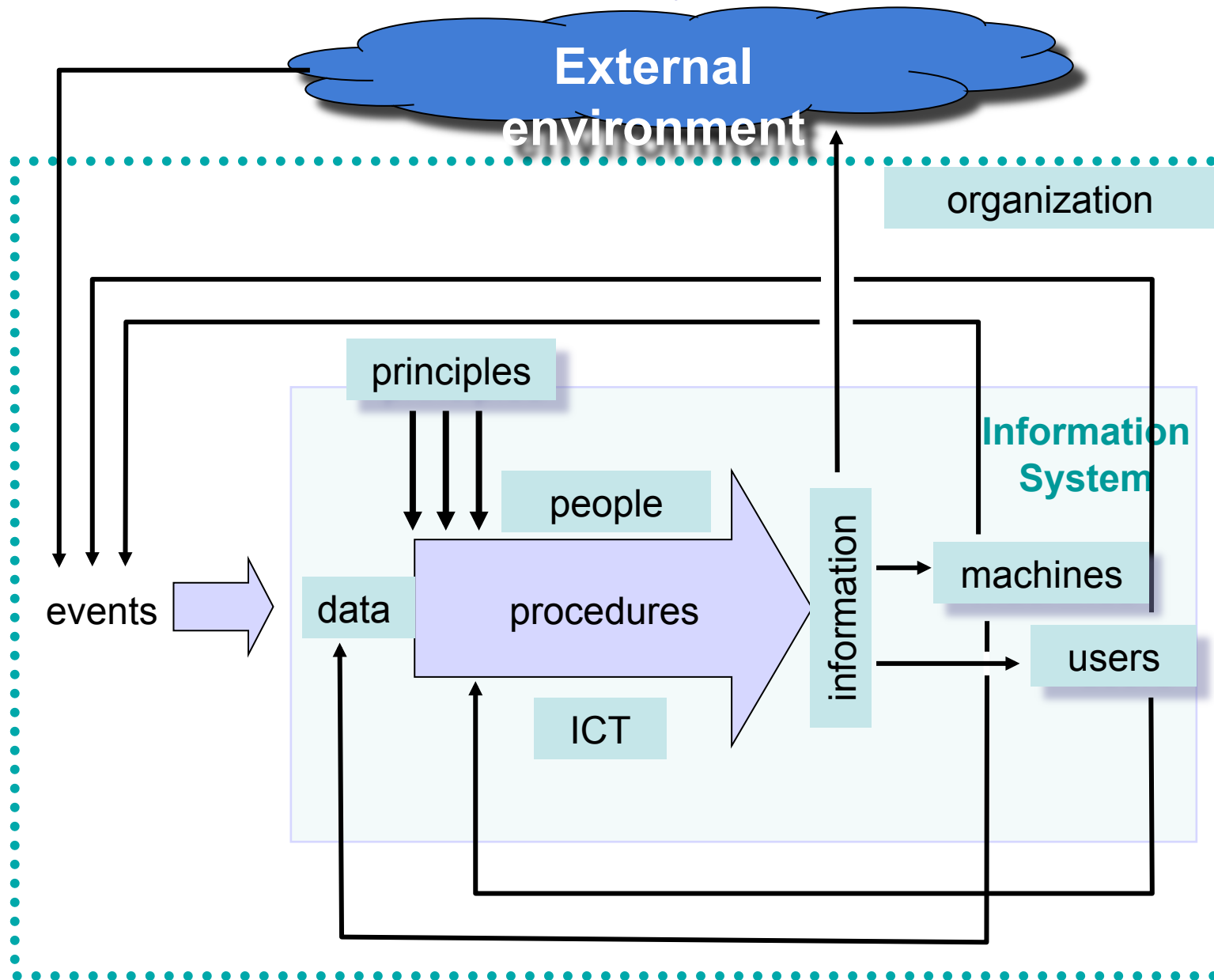
Il ruolo dell'IT in un'organizzazione

Mission / GOALS

**business processes (activities and roles)
clients - products/services**

Information

**Information Technology
(Computer Based IS)**

non- Computer Based tools and channels to manage information

organization

technology
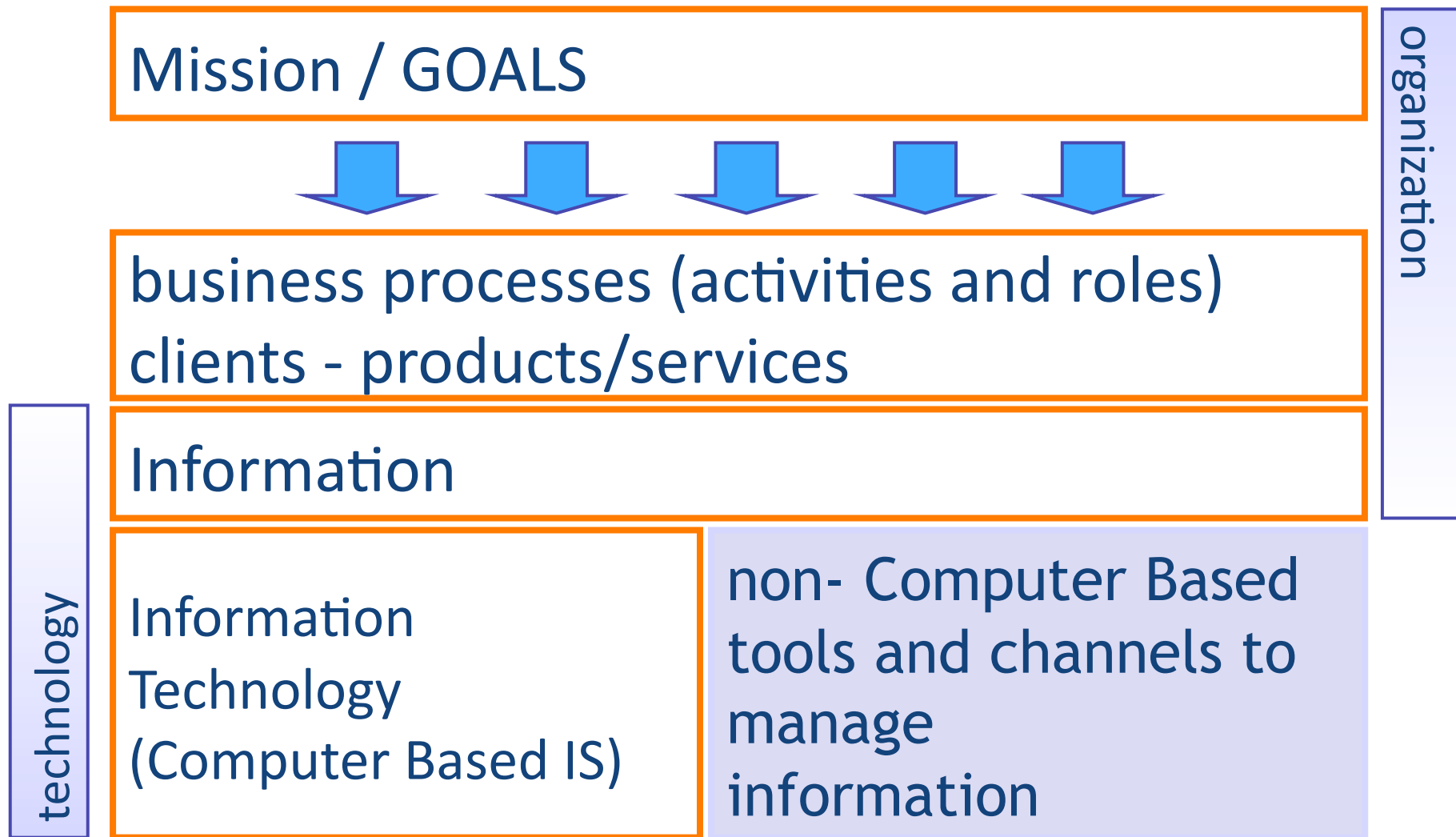
Relations between information system and ICT

Information System

Automated Information System

Computer System

How to design the right Information System?

- Starting from the users of the IS
- **Information requirements**
  - **What** information do I need?
  - **When** do I need it?
  - **Who** is supposed to produce it?
  - **How often** does information have to be produced?
  - With what level of **detail**?

  - A framework to identify information requirements: the characteristics of the IS elements
    - Formalization of **procedures**
    - **Data** structure

Formalization of procedures

- **Formalized procedure**
  - The **characteristics** of the operations to be carried out are predefined, i.e. can be described as an algorithm (example: the order management process)

- **Non-formalized procedure**
  - The **characteristics** of the operations to be carried out can not be defined "a priori" (example: a meeting of the Board to define the business strategies)

Data structure

- **Data "adequately" structured**
  - Data/Information integrated with meta-data necessary to achieve the results the user needs
  (example: phonebook)

- **Data "not adequately" structured**
  - Lack of meta-data necessary to achieve, at acceptable costs, the results the user needs

A framework for positioning the components of the IS

Data adequately structured

Data not adequately structured

IT

**Formalized procedure**

Non formalized procedure
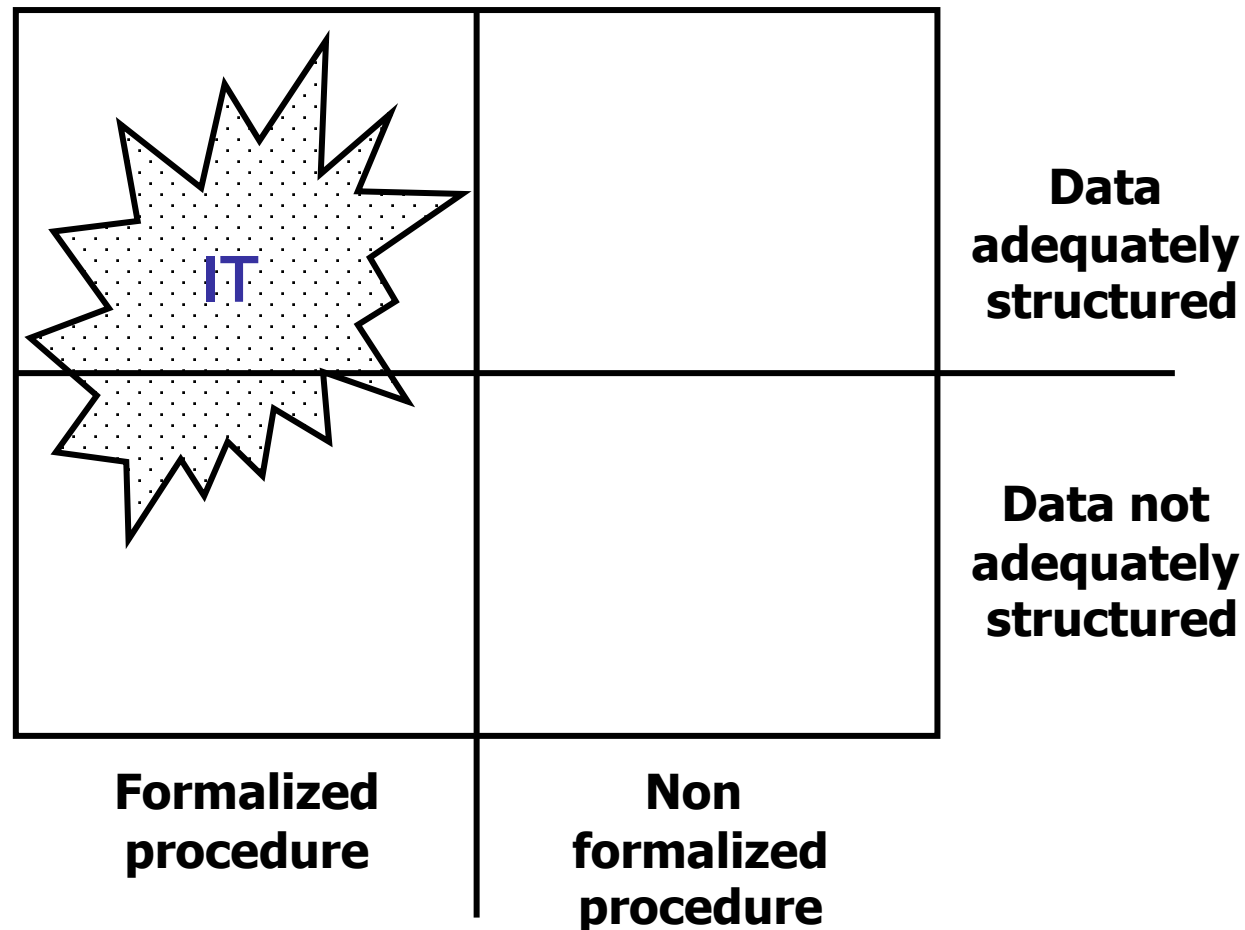
Information Technology

- **decision support**
  - Management of production process of product/service (accounting, human resource management, production, …),

- **automation**
  - part of production process of product/service (robot, diagnostic systems, ATM, …),

- **embedded**
  - part of product/service (on-board instruments, internet banking…),

- **infrastructural**
  - management of information exchange among organizations (EDI, geographical networks…).

# IT – Organization impact study

- **Decisional approach** – technology to support managerial decision processes
  - Decisions to be made when events occur
- **Transactional approach** – infrastructural technology to support inter-organizational processes for market transactions
  - Communication and information exchanges
- **Agency costs** – mixture of above technologies with technology to support coordination processes.
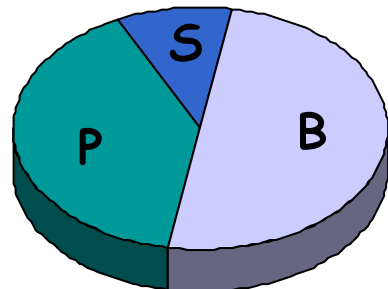
Not only technology …
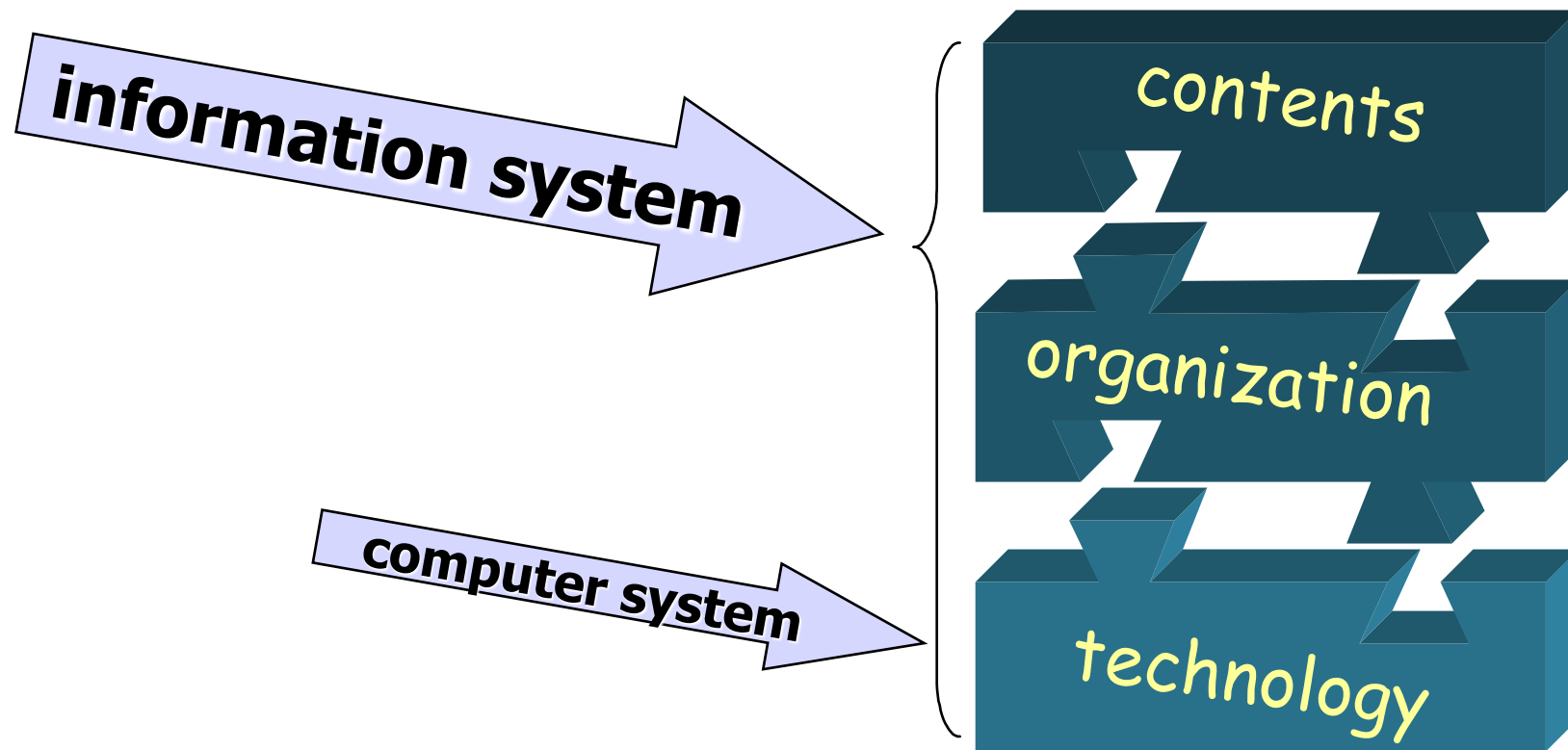
Three ingredients …

- "Brainware": **experience, uncodified competence of individuals**
  - not easily replicable

- "Paperware": **information codified on paper**
  - universally accessible and easily consultable
  - difficult to be organized and found
  - inefficient for reuse

- Software (in the network): **information managed (and shared) with automatic tools**
  - has the potential to be easily accessed and consulted
  - has the potential to be easily organized and found
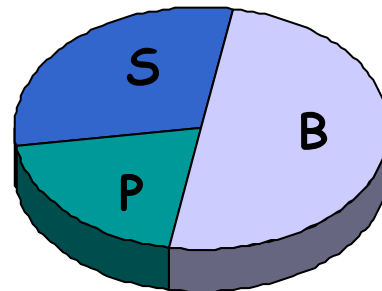 - very efficient for reuse
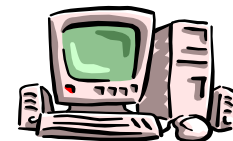
... with which mixture ?

- Organizing the information system?
- Yes, but with how much:
  - brainware?
  - paperware?
  - software (and ICT in general)?