



# Information Systems Foundations



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- **Data, Information and Knowledge**
- **System Concept**
- **Information System (IS)**
- **Information and Communication Technologies  
Architecture**
- **Classification of IS**
- **Characterization of the various types of IS**



# Information System: Concepts and Definitions

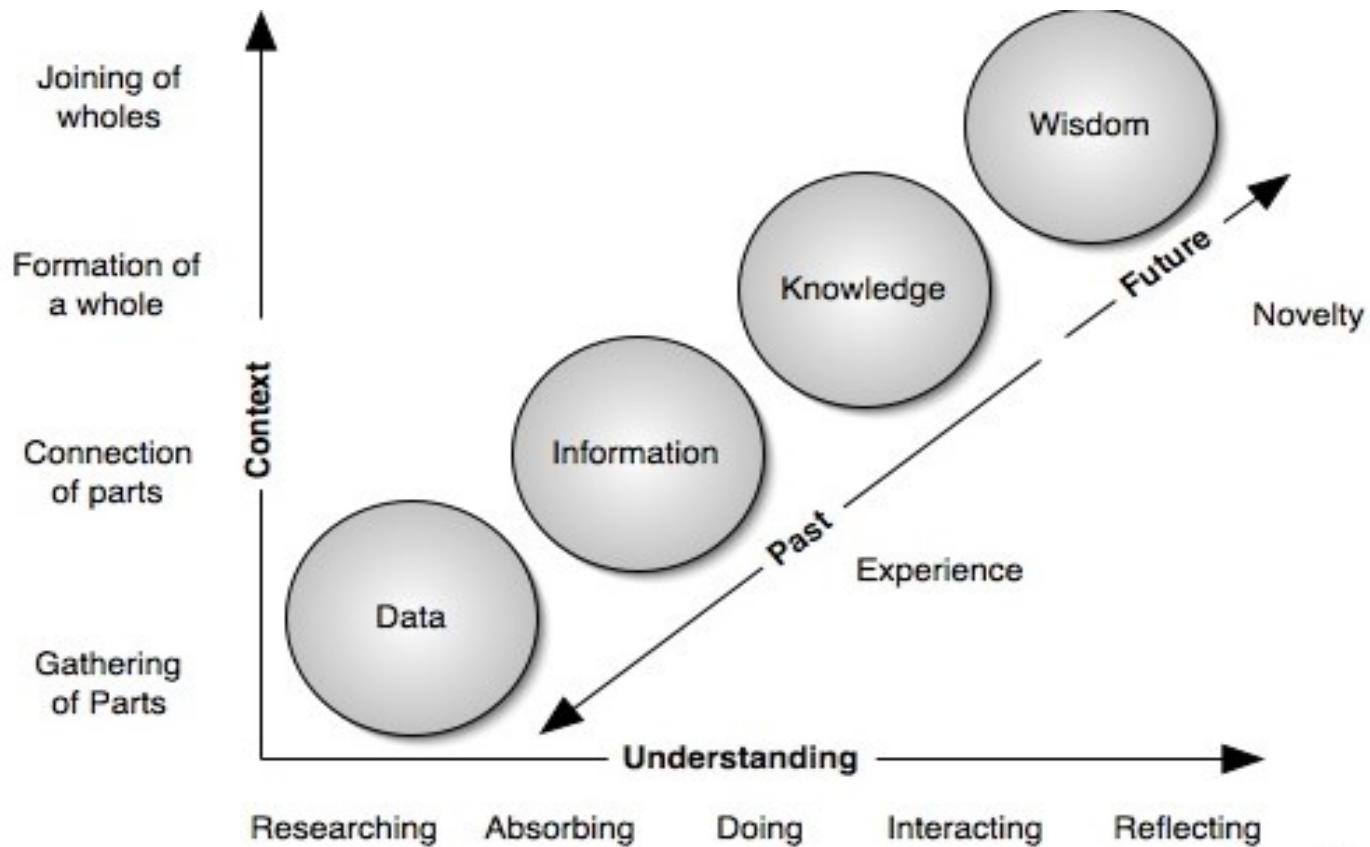
## Data, Information and Knowledge

- **Data Item.** Elementary description of things, events, activities and transactions that are recorded, classified and stored but are not organized to convey any specific meaning.
  - Selling price
- **Information.** Data organized so that they have meaning and value to the recipient.
  - invoice
- **Knowledge.** Data and/or information organized and processed to convey understanding, experience, accumulated learning and expertise as they apply to a current problem or activity

Reiner, R.K.; Turban, E.; Potter, R.E. (2007). *Introduction to Information Systems – Supporting and Transforming Business*, John Wiley.



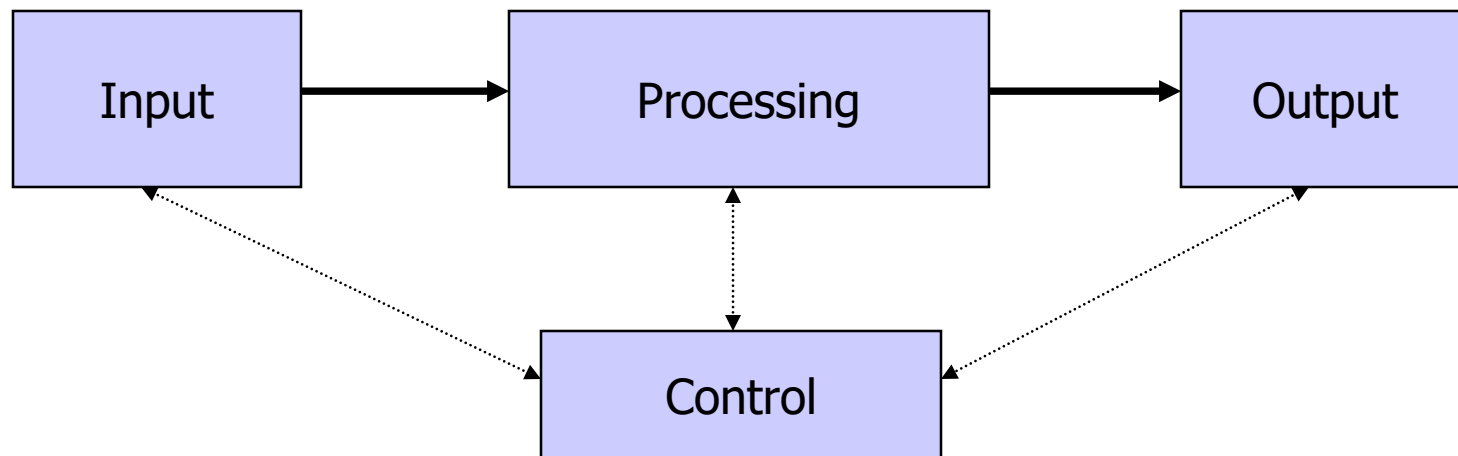
# Data, Information, Knowledge and Wisdom



Clark, D. (n.d.). *Understanding and Performance*. Accessed: 18-07-2009, em <http://www.skagitwatershed.org/~donclark/performance/understanding.html>

# System

- It is a set of related components, acting in a certain environment.
- It has as goal to achieve common objectives.
- It has self-control
- Any system consists of the following Mechanism: Inputs, Processing, Outputs and a Control



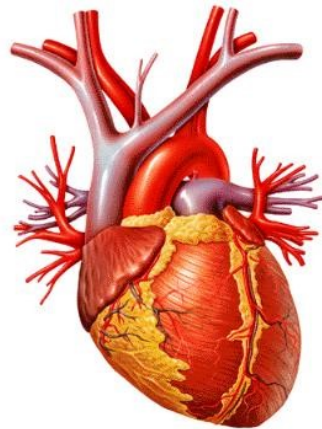
# Examples of Systems



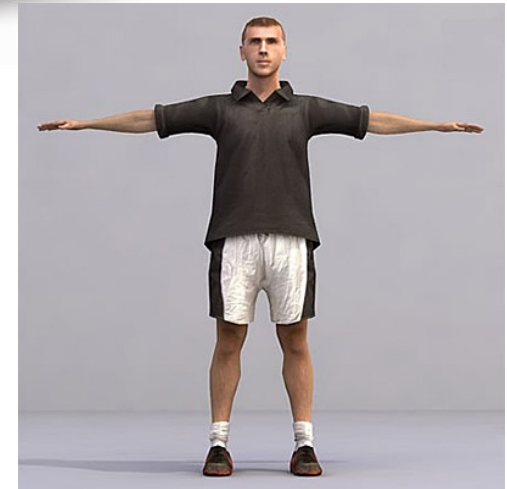
Car



Computer



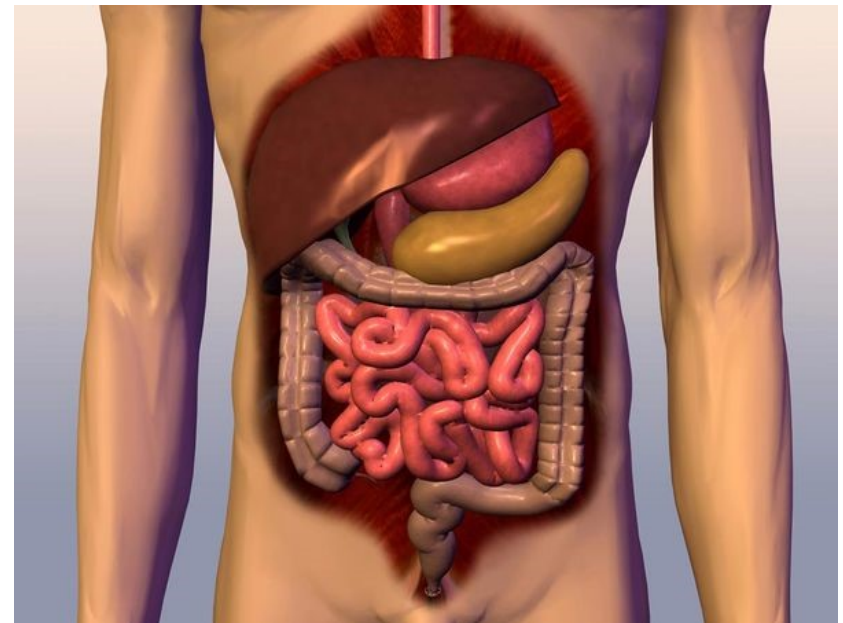
Circulatory System



Human Being

# Generic Characteristics of Systems

All systems are embedded in other systems (meta-systems) and can always be divided into smaller systems (subsystems)





# Information System (IS)

Like any other System, an Information System is composed of inputs (data, instructions) and outputs (reports, calculations). The IS processes the inputs and produces outputs that are made available to the end user or to other systems. Also included is a feedback mechanism that controls the operation. Like any other System, an IS operates in a particular environment.

Turban, E.; McLean, E.; Wetherbe, J. (1999). *Information Technology for Management – Making Connections for Strategic Advantage*, 2ª edição, John Wiley, New York.





# Information Systems (IS)

***Information systems** are implemented within an organization for the purpose of improving the effectiveness and efficiency of that organization.*

*Capabilities of the information system and characteristics of the organization, its work systems, its people, and its development and implementation methodologies, together determine the extent to which that purpose is achieved.*

Silver, M. S., Markus, M. L. e Beath, C. M. (1995). The Information Technology Interaction Model: A Foundation for the MBA Core Course, *MIS Quarterly*, 19 (3), pp. 361-390.



# Organizational Information Systems (OIS) (1/3)

- **An Organizational Information System (OIS) is a socio-technical system composed of people, procedures, data / information and ICT components (hardware, software and communications), which collects, processes, stores, analyzes and distributes information to support Operations and Decision-making**
- **An OIS should allow the coordination and integration of the organization's business processes**



# **Organizational Information Systems (OIS) (2/3)**

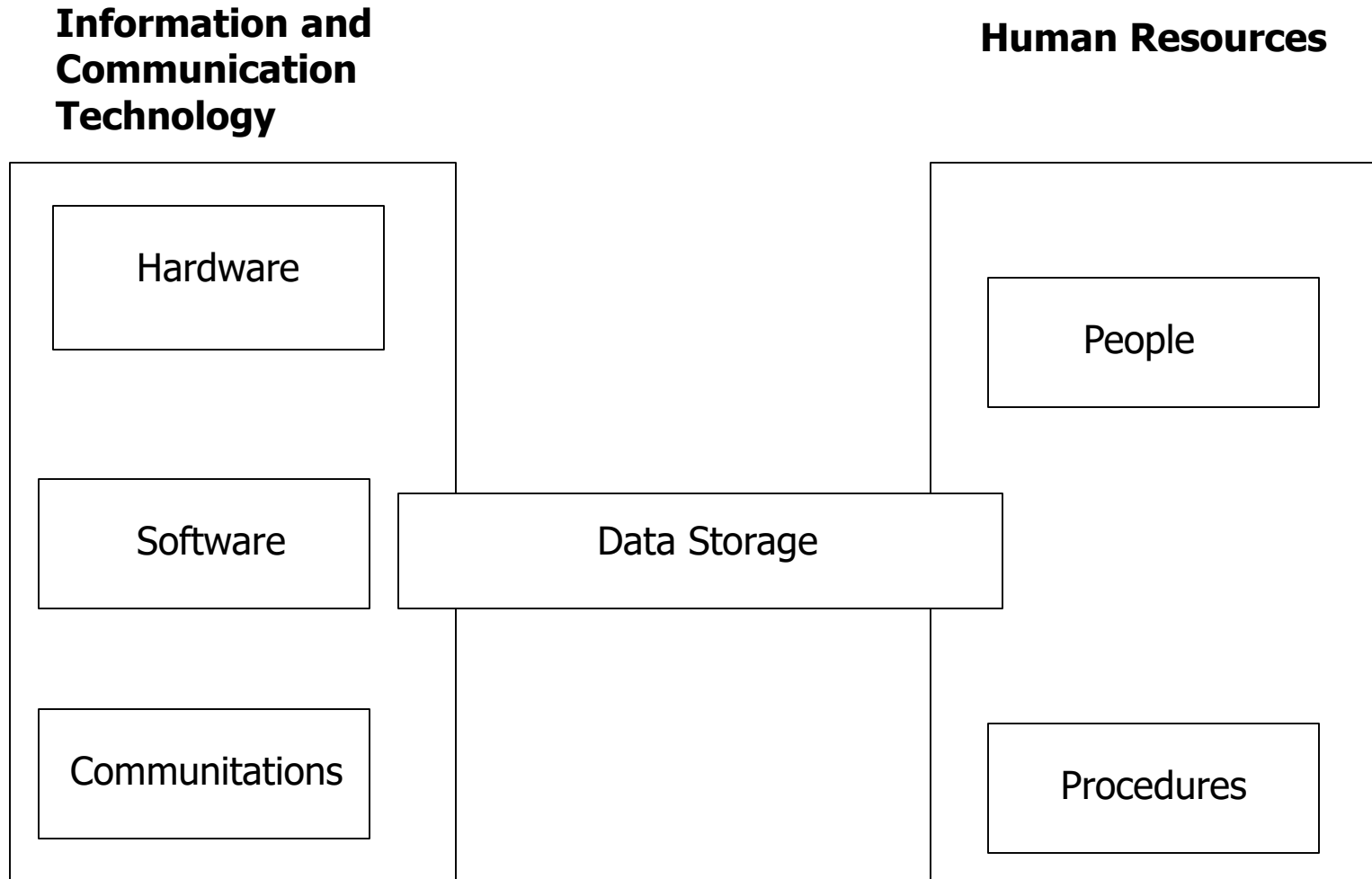
## **Objetives**

**The purpose of the Organizational Information System (OIS) is to provide information to support:**

- 1. Operations - Activities developed within the value chain of an organization with the purpose of creating value for the stakeholders.**
- 2. Decision Making Activities at Operational, Tactical and Strategic Levels**



# Organizational Information Systems (OIS) (3/3) Components



Adaptado de Robert Nickerson (2009)  
<http://online.sfsu.edu/~rnick/mannheim/lecturerev.pdf>

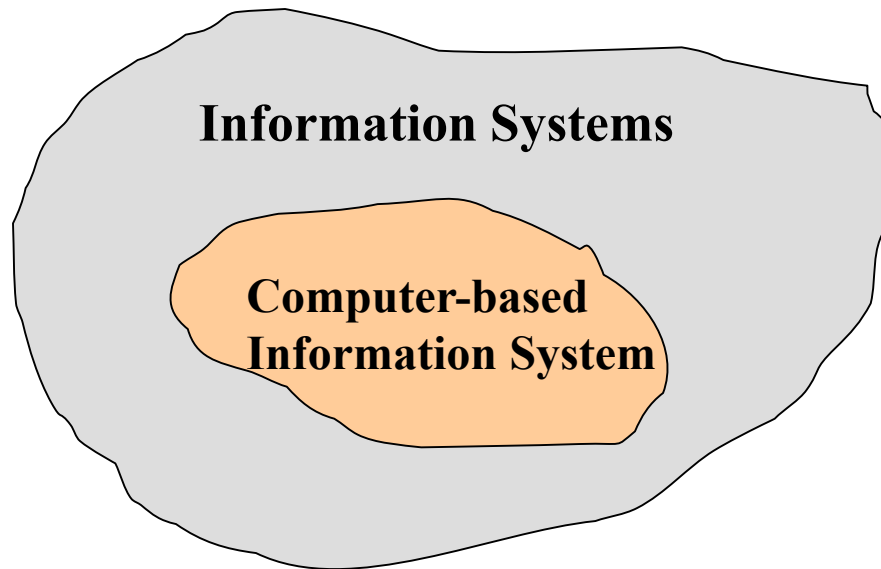


# Automated Information System (1/2)

- Information System (IS). Collects, processes, stores, analyzes and disseminates information for a specific purpose.
- *Automated Information System or* Computer-based Information System (CBIS). An information system that uses computer technology to perform some or all of its intended tasks.



# Automated Information System (2/2)





# Types of Information Systems

There are multiple ways to classify Information Systems, for example based on:

- **Extension of System Usage**
- **System Objectives**



# Types of Information Systems

## Extension of System Usage

- **Single - Affects a single user. Ex: Microsoft Office, OpenOffice**
- **Workgroup - Affects a group of users. Ex: Lotus Notes, Wikis, ...**
- **Organizational - Affects much of the organization. Ex: TPS, ERP, CRM, SCM, ...**
- **Interorganizational - Enables the automation of information flows between organizations (eg, supply management in the automotive industry)**





# Types of Information Systems

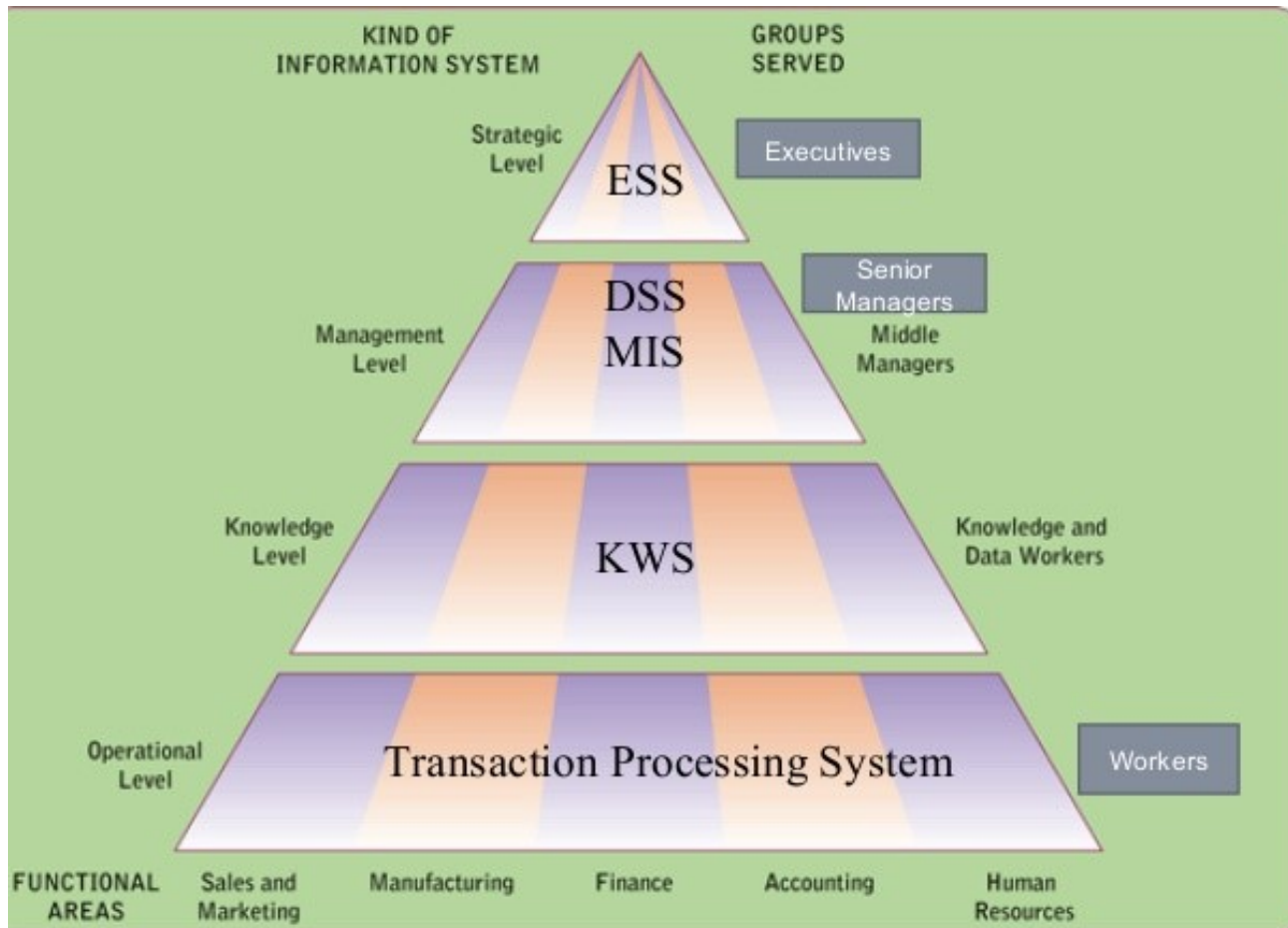
## System Objectives

- The typology of Information Systems according to Laudon and the role of each type of system identified

Laudon Kenneth P.; Laudon, Jane P. (2015) *Management Information Systems – Managing the Digital Firm*. Global Edition. Pearson.

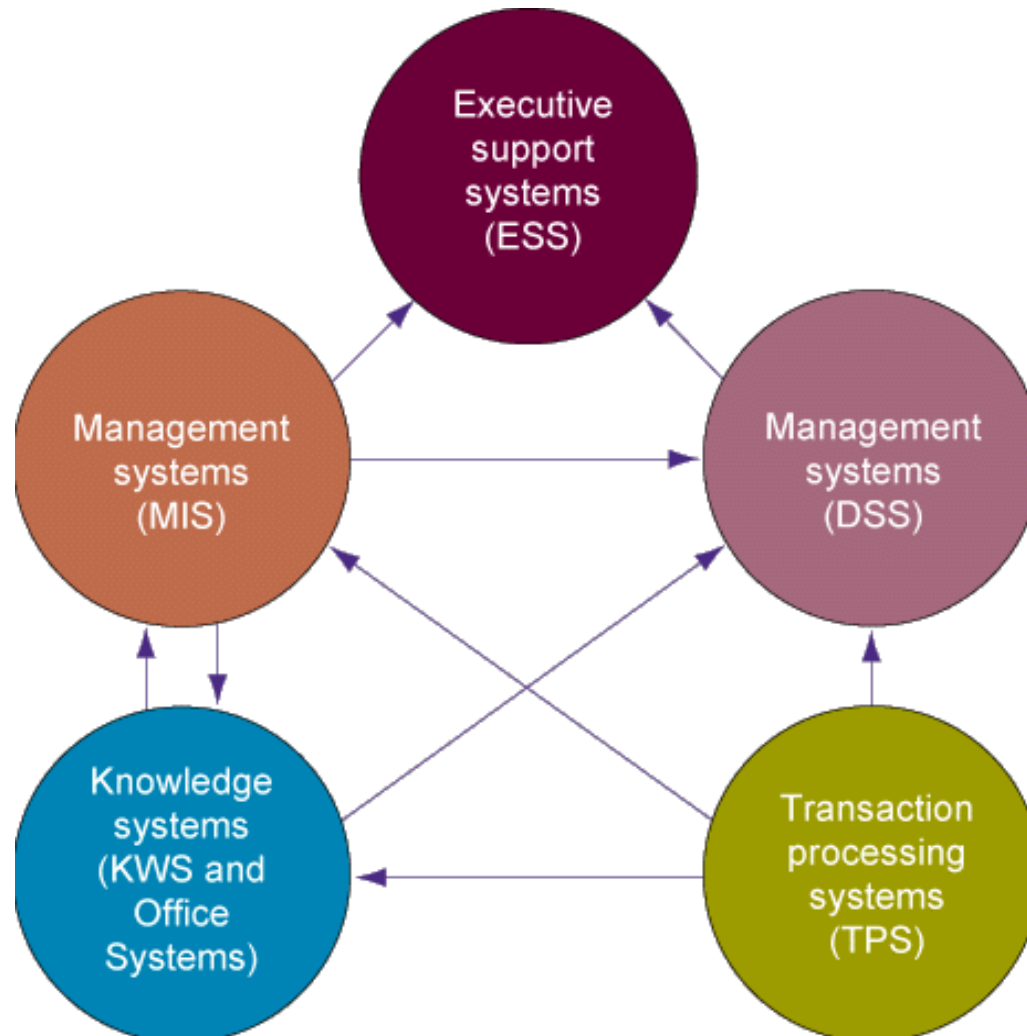
(Laudon & Laudon): [Cap-9], [Cap-10]

# Types of Information Systems Relationship with the organization





# Level of Decisions and Information Systems



Laudon, MIS, 8 ed



# Information Systems Examples

## TYPES OF SYSTEMS

Executive Support Systems (ESS)

Strategic-Level Systems				
5-year sales trend forecasting	5-year operating plan	5-year budget forecasting	Profit planning	Personnel planning

Management Information Systems (MIS)

Decision-Support Systems (DSS)

Management-Level Systems				
Sales management	Inventory control	Annual budgeting	Capital investment analysis	Relocation analysis
Sales region analysis	Production scheduling	Cost analysis	Pricing/profitability analysis	Contract cost analysis

Knowledge Work Systems (KWS)

Office Systems

Knowledge-Level Systems		
Engineering workstations	Graphics workstations	Managerial workstations
Word processing	Document imaging	Electronic calendars

Transaction Processing Systems (TPS)

Operational-Level Systems				
Order tracking	Machine control	Securities trading	Payroll	Compensation
Order processing	Plant scheduling	Cash management	Accounts payable	Training & development
	Material movement		Accounts receivable	Employee record keeping
Sales and Marketing	Manufacturing	Finance	Accounting	Human Resources

# TPS – Transaction Processing Systems

- Support daily primary and secondary activities
- Indispensable for the operation of the business
- They support the most "elementary", essential and highly structured business processes
- They also support decisions, but more operational
- They also control, but it is operational control

What activities?

How?

May support non structured processes?  
Why?



# TPS – Transaction Processing Systems

- Granularity of the information generated in a transaction is very detailed
- Generates lots of data and some information
- Extremely critical from the point of view of availability and performance
- Real-Time
- Accuracy of data (accuracy)

Example?

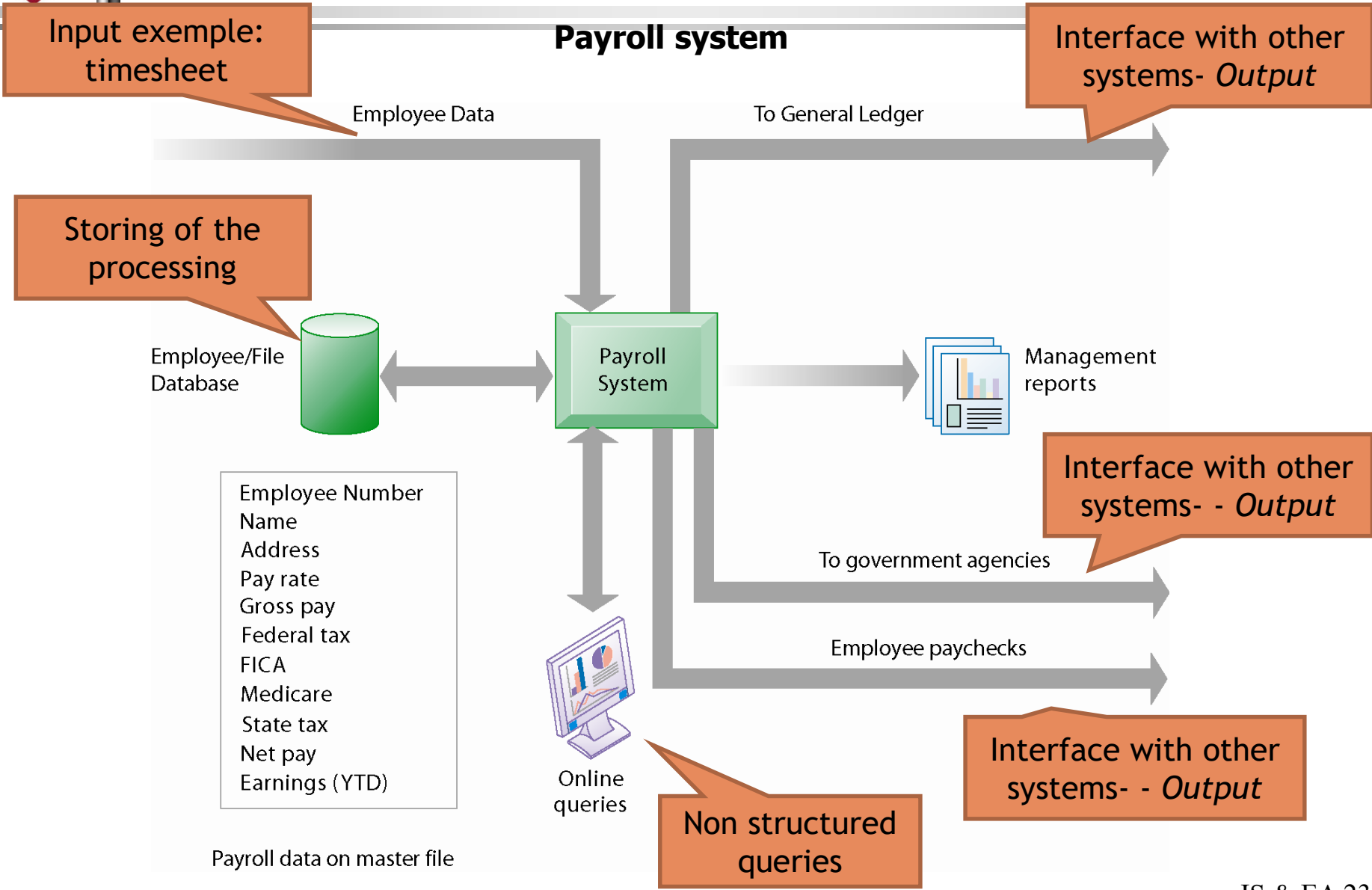
But it is not the same thing?

Diference between availability and performance?

It is always like this?



# TPS – Transaction Processing Systems





# MIS – Management Information Systems

- Control and Monitor Performance and Operational Availability
- Support intermediate management
- They base their data on TPS information
- Little or no analytical capacity
- High single point of truth and accuracy

Analitical capabilities? What is it?





# MIS – Management Information Systems

- Reports, Dashboards e Structures semi-structured Queries
- Can be in Real Time or near
- Information and not data
- Information not so granular but able to drill down
- Intermediate Criticity

Why it is near *real time*?

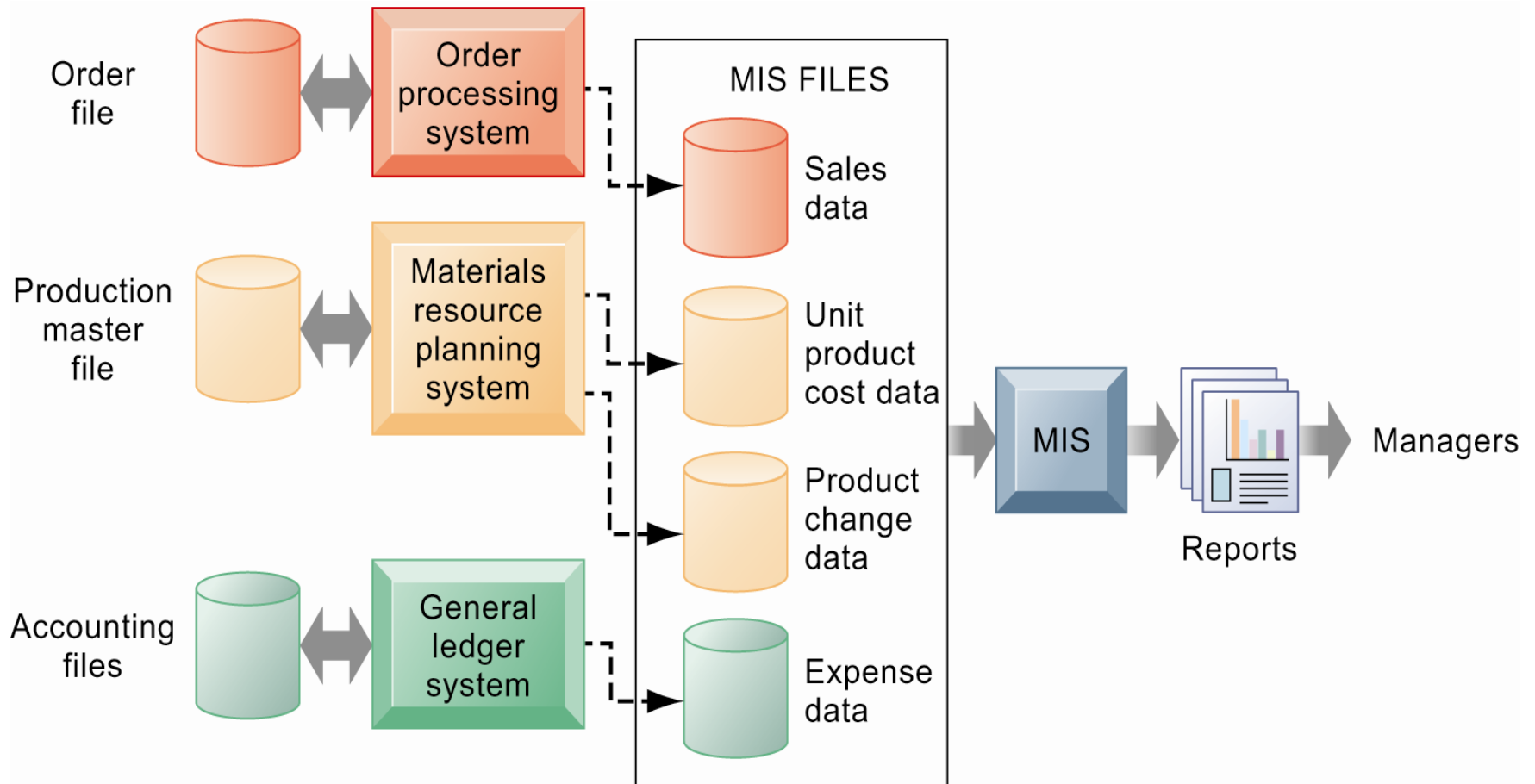
Why is it needed?



# Information from TPS to MIS

## Transaction Processing Systems

## Management Information Systems





# MIS – Report Example

Consolidated Consumer Products Corporation Sales by Product and Sales Region: 2009

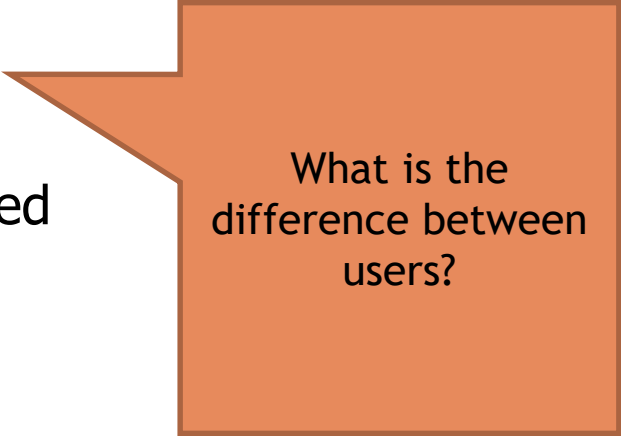
PRODUCT CODE	PRODUCT DESCRIPTION	SALES REGION	ACTUAL SALES	PLANNED	ACTUAL versus PLANNED
4469	Carpet Cleaner	Northeast	4,066,700	4,800,000	0.85
		South	3,778,112	3,750,000	1.01
		Midwest	4,867,001	4,600,000	1.06
		West	4,003,440	4,400,000	0.91
		TOTAL	16,715,253	17,550,000	0.95
5674	Room Freshener	Northeast	3,676,700	3,900,000	0.94
		South	5,608,112	4,700,000	1.19
		Midwest	4,711,001	4,200,000	1.12
		West	4,563,440	4,900,000	0.93
		TOTAL	18,559,253	17,700,000	1.05

What is the granularity?

Non complex summaries

# Decision Support Systems

- Intermediate management
- Concrete problems well identified and delineated
- Supports non-routine and poorly structured decisions
- Example: Impact on production if energy consumption in December doubles (case REN - EDP)
- Information from TPS and external sources

A large orange callout box with a pointer on the left side, containing the text: "What is the difference between users?"

What is the difference between users?

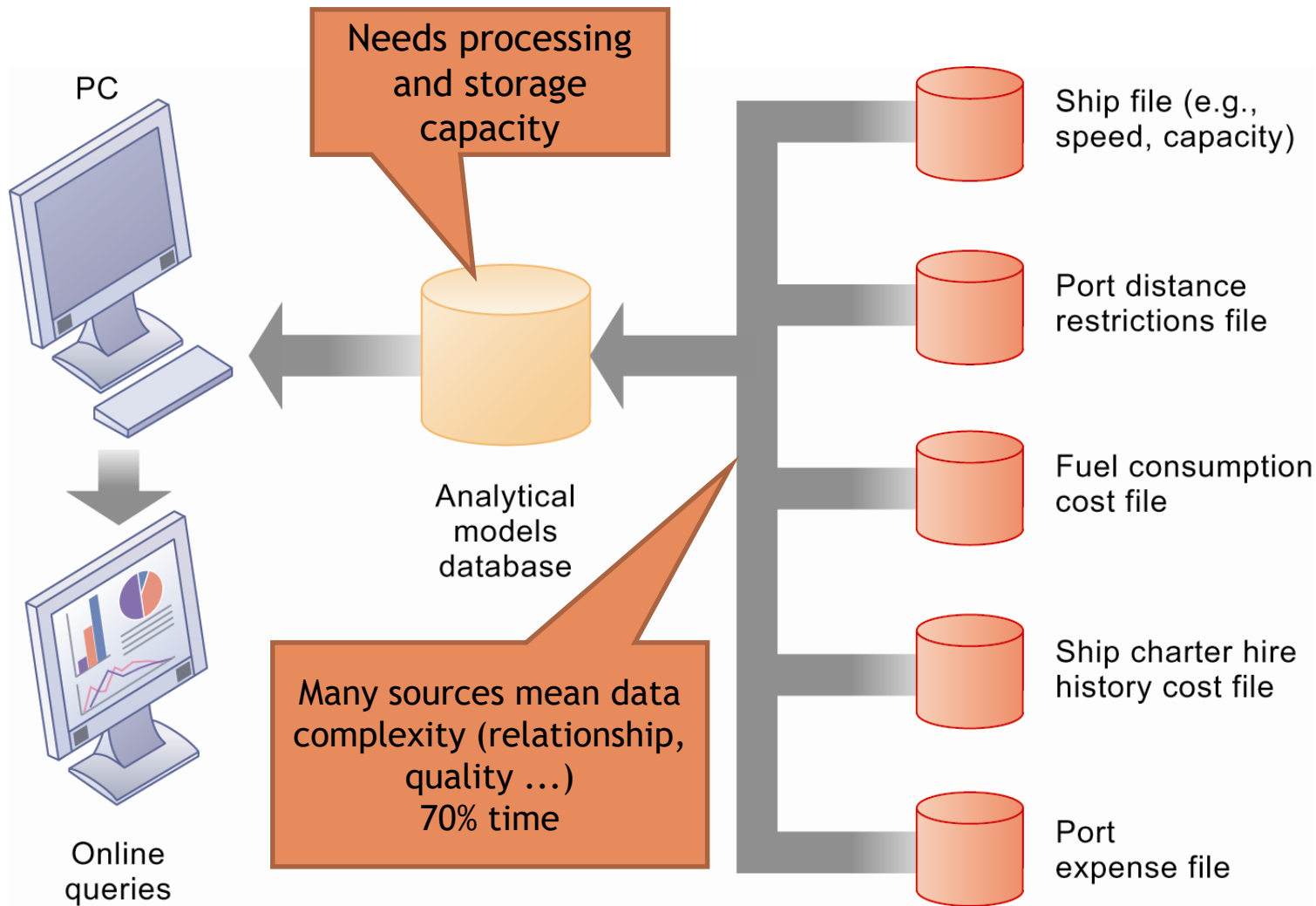
A smaller orange callout box with a pointer on the left side, containing the text: "Why?"

Why?

Example: Calendar of holidays and day-off; Business Event Listing

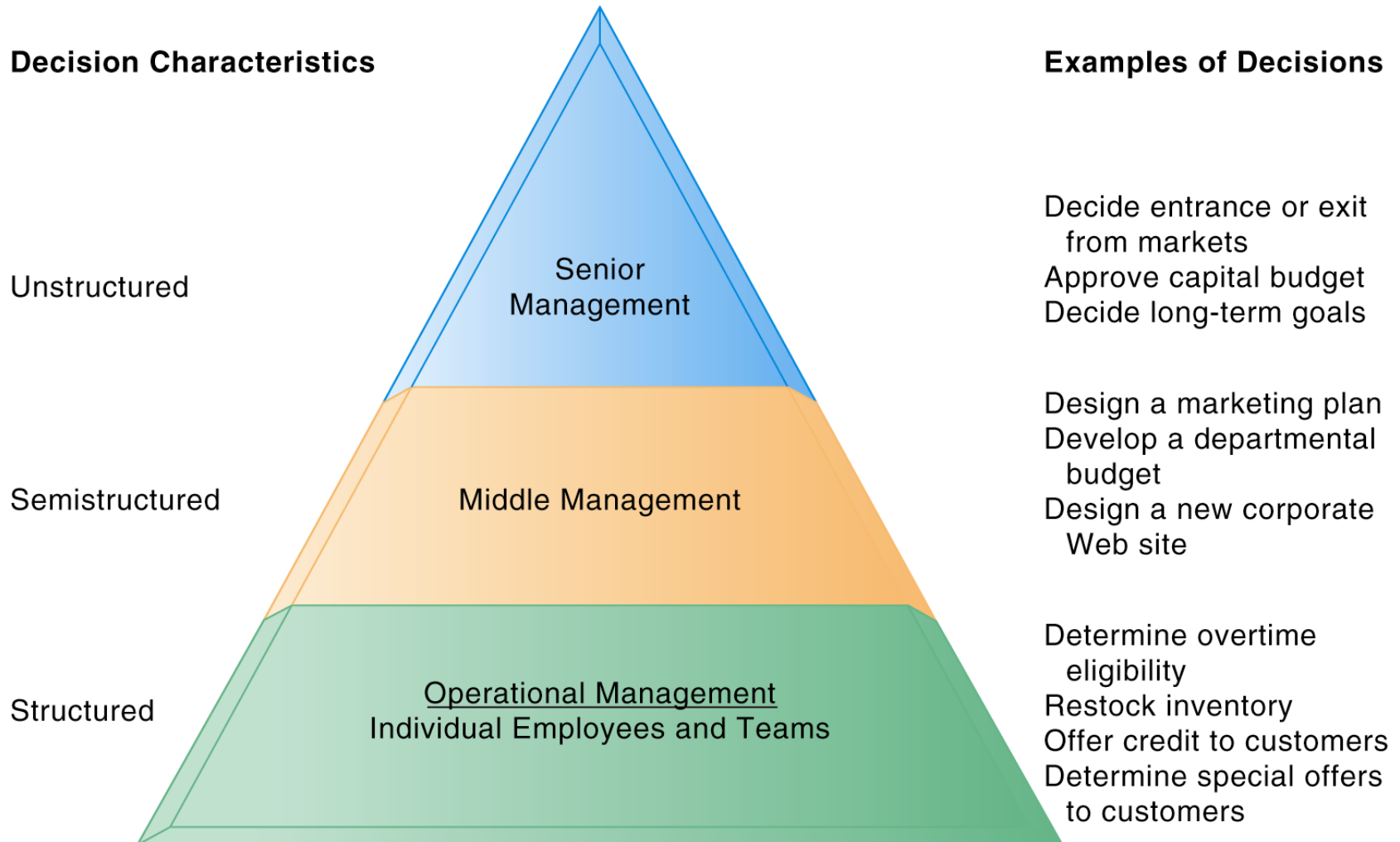
# Decision Support Systems

## Decision Support System on Travel Estimates



# Decision Support Systems

## Characteristics and Examples of Decisions



# ESS - Executive Support Systems

- Support top management
- Strategic Support Decisions
- They can not cover the whole decision, but rather support a decision that is always based on a more thorough and therefore humane assessment
- Get information from TPS, MIS, DSS and external



Why?



# ESS - Executive Support Systems

- Usually give trend values
- Easy-to-use, variable-handling interfaces
- It may have complex calculation components based on management formulas (eg satisfaction index)
- Scorecards, trend analyzes, interactive maps
- ...

Why?

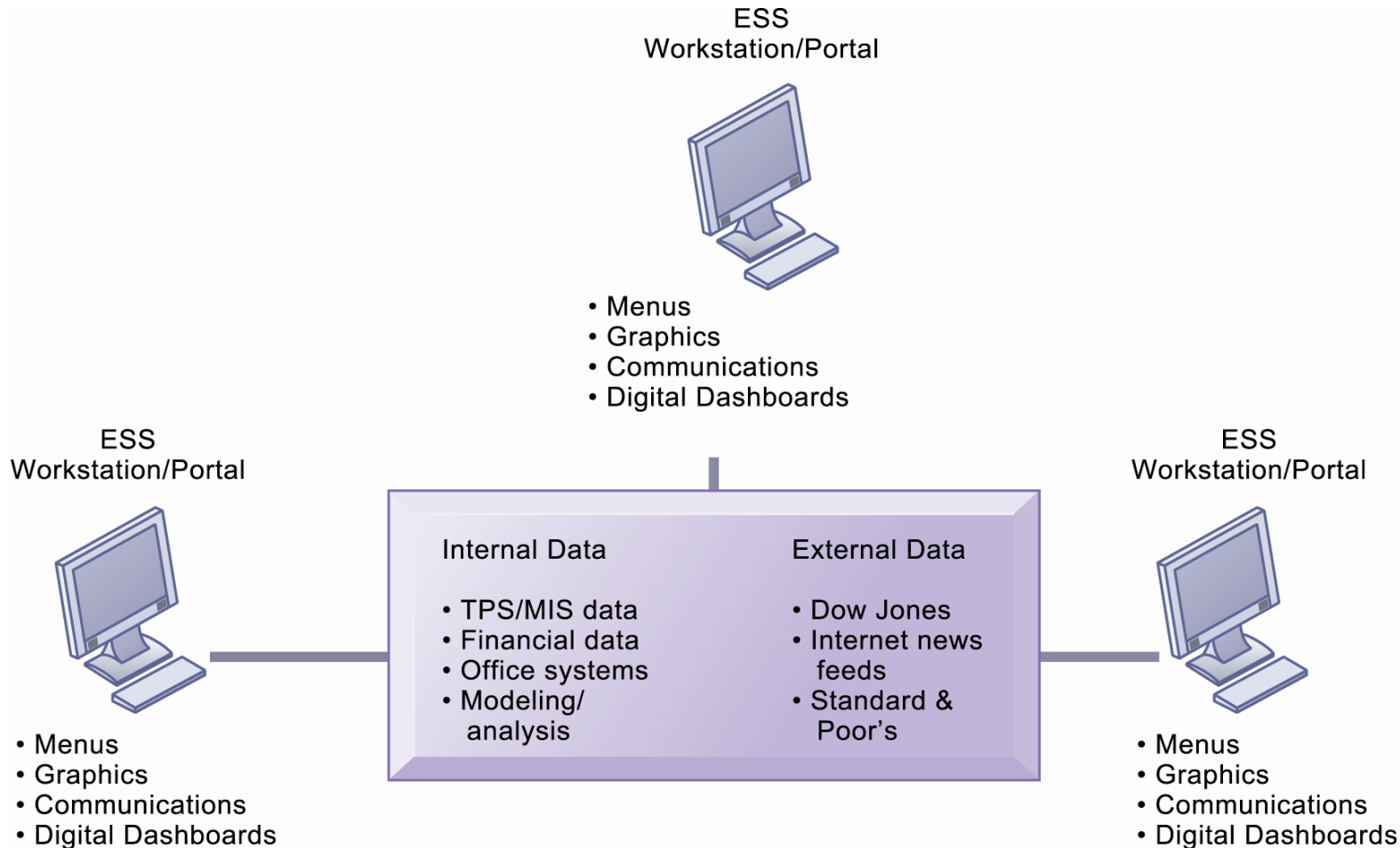
Other examples?





# ESS - Executive Support Systems

## ESS Model



# TPS, MIS, ESS users' characteristics

## ▪ TPS

- support operational activities
- routine and repetitive tasks
- optimized operability
- Operational Users
- use training
- sporadic and very turnover users
- users may suggest changes in operability but it is unusual action

Why?

Have you ever been in this position?

Why?

## TPS, MIS, ESS users' characteristics

- **MIS e DSS**

- support tactical activities (control and reporting)
- users are expert having specific skills in a field
- Low turnover
- training in the outputs and their manipulation
- users change outputs

Estes sistemas são para “você” depois de saírem da universidade?

Why?

Why? Is it relate to the specialization? And/or change in market?

# TPS, MIS, ESS users' characteristics

## ▪ ESS

- support for strategic activities
- Users are industry subject experts
- users with little training in the tools
- users with medium turnover
- users request changes to outputs

*Industry Pourquoi?*

Why? Time and/or  
Need?

Why more than the  
middle managers?



# Outputs and Relationship

## TPS

- Source of Data
- Provides data to all types of Systems
- Outputs: Data table

**If these systems do not work,  
what happens to the others?**



# Outputs and Relationship

## MIS

- Source of information
- Provides aggregated data to ESS
- Outputs: Aggregate Reports; replicable models (or templates)
- You can reintroduce support information to TPS

## ESS

- Source of trends
- Output: scorecards, graphics, trends analysis



# Types of Information Systems

## Summary Table

Característica	TPS	MIS-DSS	ESS
Type of users			
Position in the organizational Hierarchy			
Granularity			
Performance			
Availability			
Type of Inputs			
Type of Outputs			
Users Training			
Users' influence			
Information accuracy			



*And, as shown, the purpose of information systems is **to provide:***

- ***The right information***
- ***To the right people***
- ***At the right time***
- ***In the right amount***
- ***In the right format***

Reiner, R.K.; Turban, E.; Potter, R.E. (2007). *Introduction to Information Systems – Supporting and Transforming Business*, John Wiley.





# Contributors

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