Definition and views of Information Systems

SoftEng
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Information system

- IS – Definition, larger scope
  - System to store and process information used by organizations
    - Includes paper, people, computers and software
- (CB)IS – Definition, reduced scope
  - Computer based system to store and process information used by organizations
  - Also known as CBIS (Computer based IS)

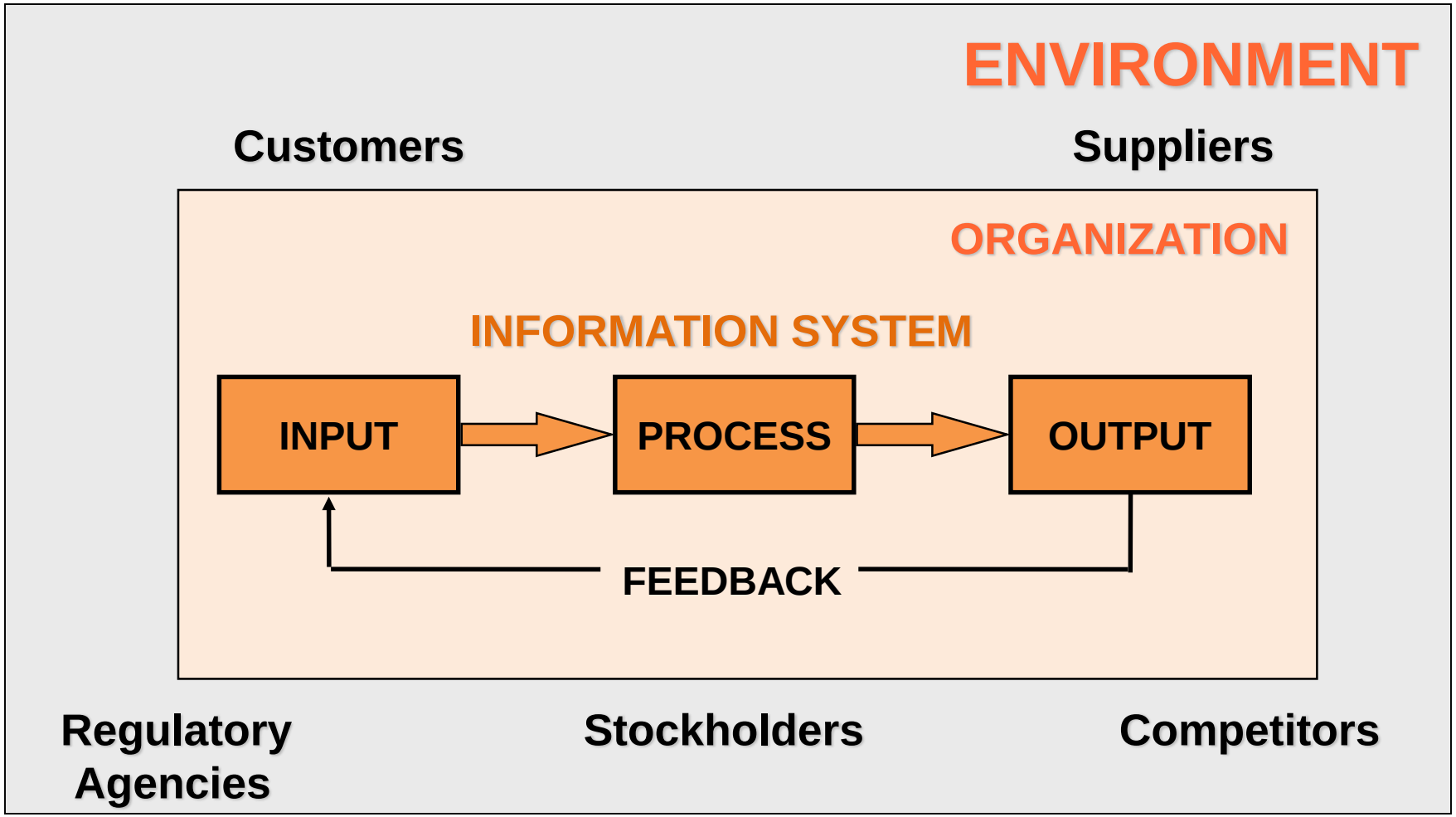
Information system

- IS – Definition, Laudon
- Interrelated components working together to
  - collect, process, store, and disseminate
- information to support
  - decision making, coordination, control, analysis, and visualization
- in an organization

Information System vs Computer System

- Information System:
  - Hardware +
  - Software +
  - Technical knowledge +
  - Organizational knowledge
- Computer System: technical system related to the information system (only marginally focus of this course)
- The goal is to design and evaluate the Information System (not only the computer system)

IS, high level functions



- Input
  - The capture or collection of raw data from within the organization or from its external environment for processing in an information system
- Output
  - The distribution of processed information to the people who will use it or to the activities for which it will be used

- Processing
  - The conversion, manipulation, and analysis of raw input into a form that is more meaningful to humans
- Feedback
  - Output that is returned to the appropriate members of the organization to help them evaluate or correct input

Organization vs. Enterprise

- Organization: control structure that manages processes
  - E.g. enterprise, army, church, public administration, football team, hospital, university
  - Includes: people, structure, and goal
- Enterprise: is a specific case of organization
  - Focused on goods or services production, for profit

Organizations

- People
  - Managers, knowledge workers, data workers, production or service workers
- Structure
  - Organization chart, geography, groups of specialists, products
- Business function
  - Specific task performed in a business organization
- Business process
  - How activities are organized

Major business functions

- Manufacturing
- Sales & marketing
- Finance
- Accounting
- Human resources

- Software integrates all facets
  - Planning, manufacturing, inventory, sales, finance, accounting

Business process

- The unique ways in which organizations coordinate and organize work activities, information, and knowledge to produce a product or service

PROCESS ANALYSIS: EXAMPLE

Description of current situation

The production department of a medium-sized company needs to place orders for raw materials, required to feed the production processes, anytime they are no available in the warehouse.

Such materials have to be:

- Ordered (Negotiation p, Q, T; provided selection, coordination with production needs)
- Examined to verify quality
- Stored in the warehouse
- Registered in the accounting system
- Payed

- The above operations must also be checked

There are 8 actors involved in the scenario.

Which are the actors? (1)

A possible task attribution is the following:

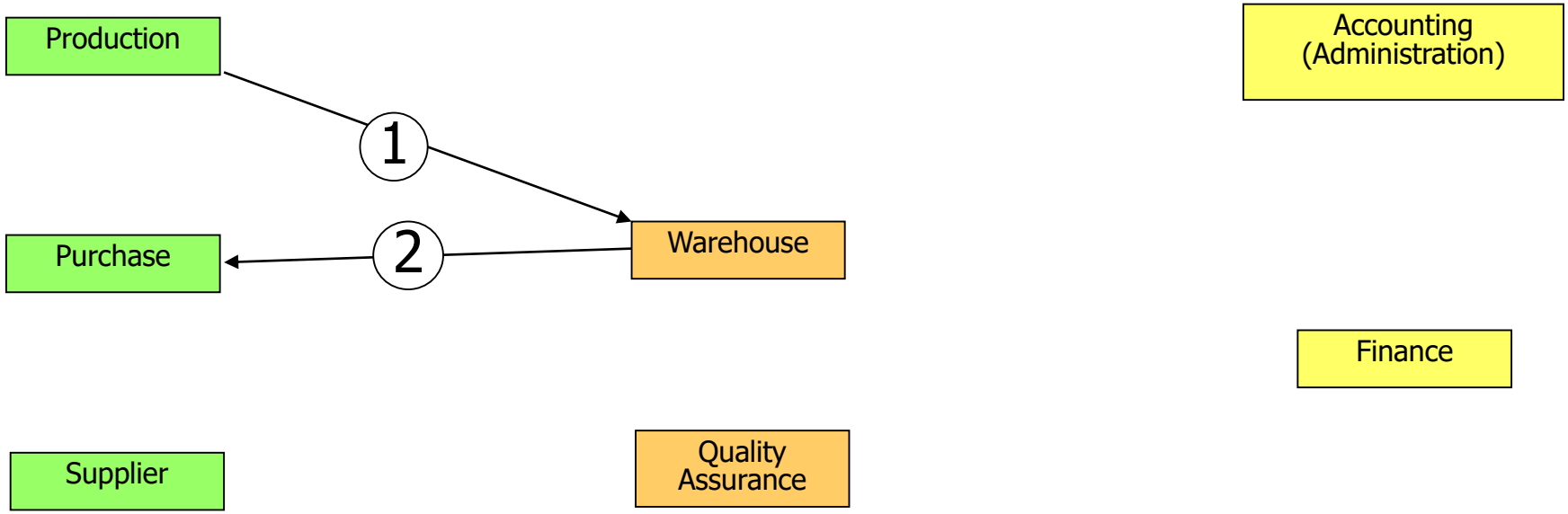
- Production: requires the raw materials needed for the the production plans from the warehouse
- Warehouse: when the raw material is not available, first make a request to the purchase office; once the order has been received checks the quality, conformance to request, and stores it.
- Purchase office: in charge of negotiating price, quantity, and delivery time with different suppliers
- Supplier: the one chosen to fulfill the order, must deliver the raw materials to the warehouse, and possibly get back the portion not complying with the specifications

Which are the actors? (2)

- Quality assurance: monitors the efficiency and quality of suppliers by producing statistics for the management
- Accounting: check the orders, receive the delivery receipt from the warehouse, ask the finance department to execute the payment of the supplier invoice, records all transactions
- Finance department: fiscally performs the payment to the supplier and then informs the accounting
- Manager: is a role external to the individual business process that supervises the good working of the enterprise system and controls the economical efficiency. Needs information to take decisions.

Flow representation

Operative process

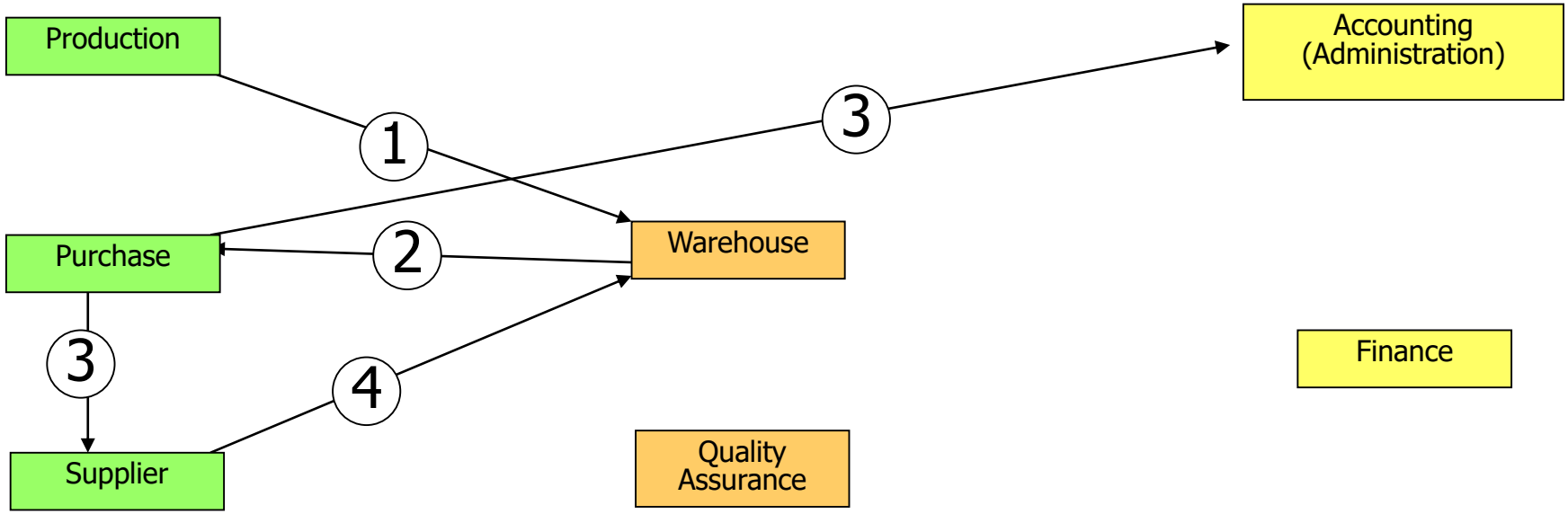


1. Production asks Warehouse for raw materials

2. Warehouse has not the RM and forwards a request to the Purchase office

Flow representation

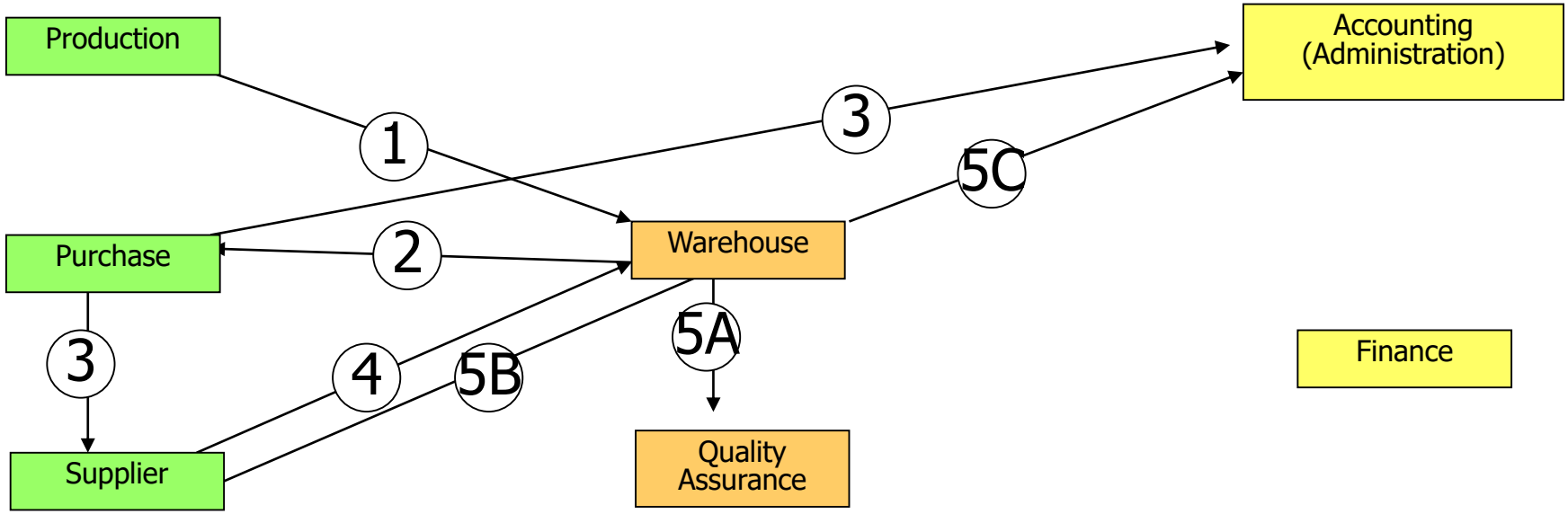
Operative process



3. Purchase office negotiates with the chosen supplier, price, quantity, and delivery; issues the order and sends a copy to the accounting department
4. The Supplier delivers the materials to the warehouse together with the relative delivery note

Flow representation

5C.Accounting receives copies of the delivery notes and the amount of returned materials

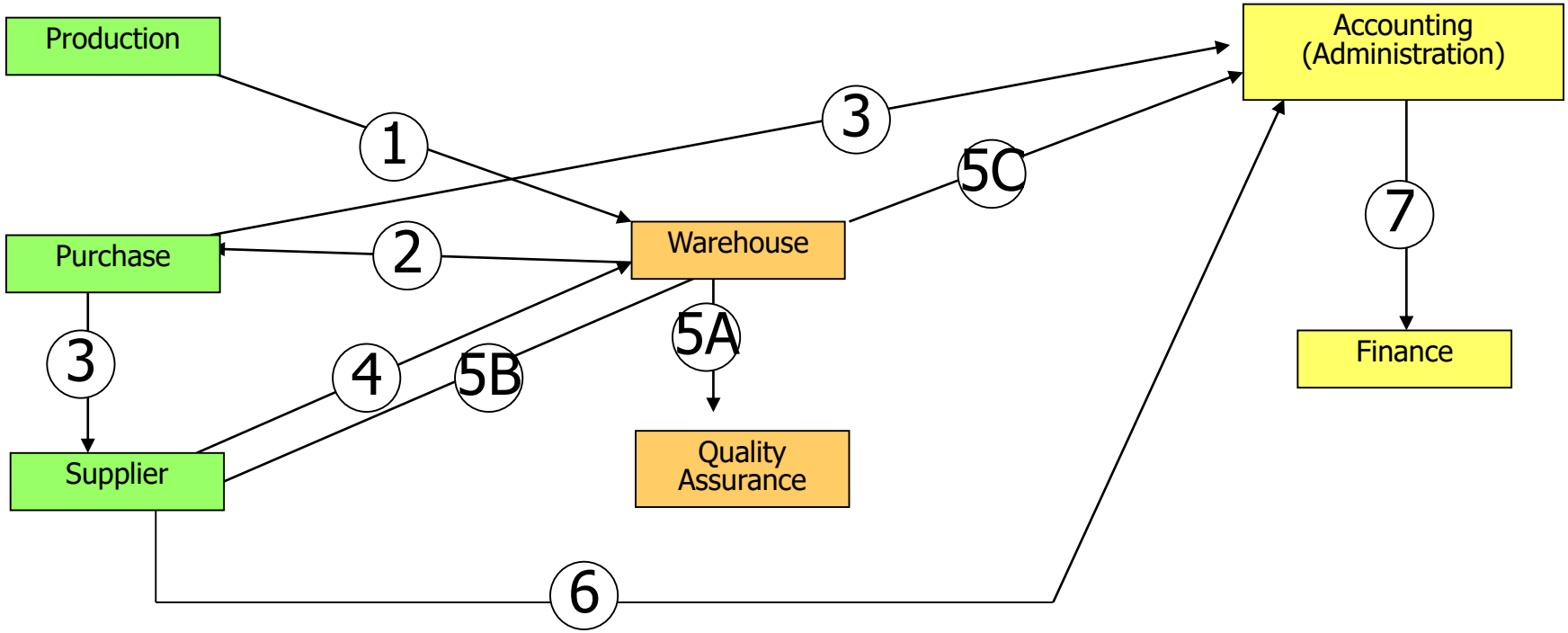


5A. Warehouse checks the received materials and sends a report to Quality Assurance concerning the complieance with the order specifications.

5B. Warehouse returns possibly defective goods to Supplier

Flow representation

Operative process

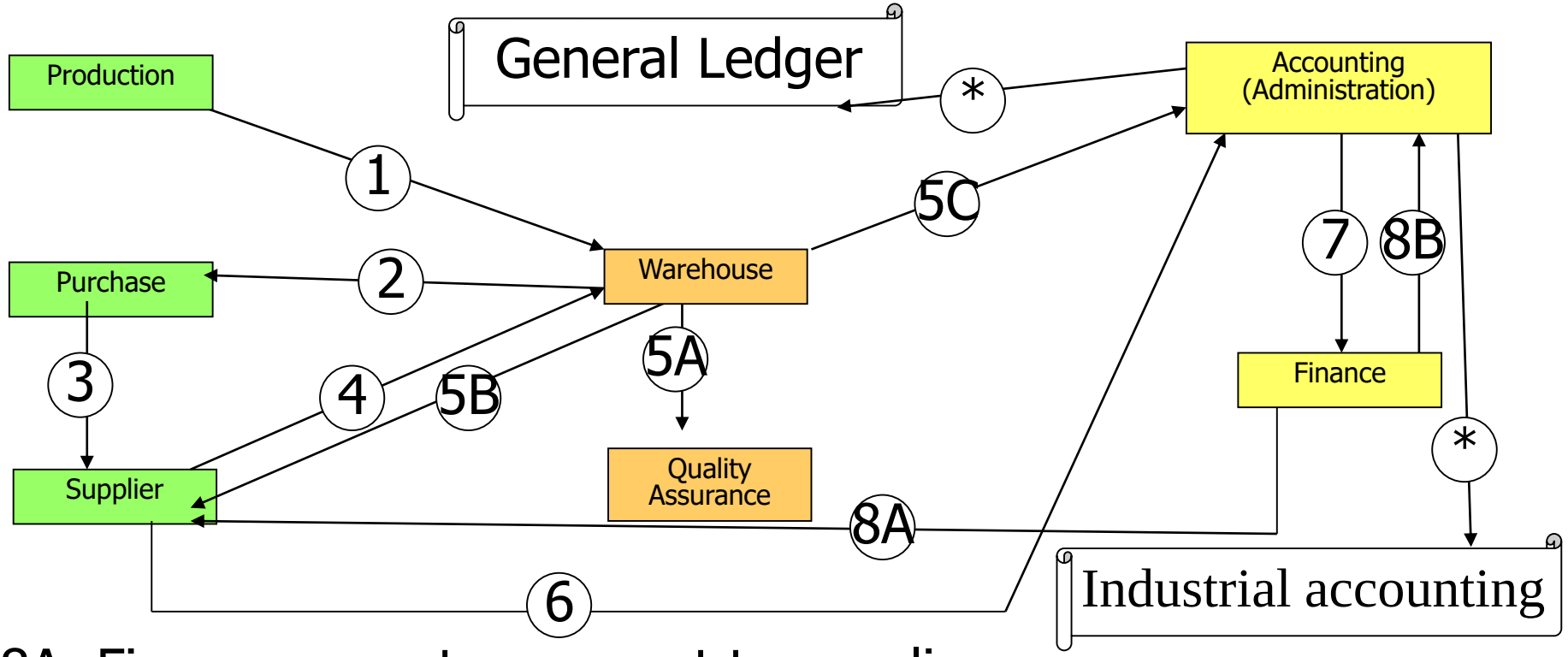


6. Supplier sends invoice to Accounting
7. Accounting checks the invoice (compare with orded and delivery note) and ask Finance to proceed with payment.

Flow representation

Operative process

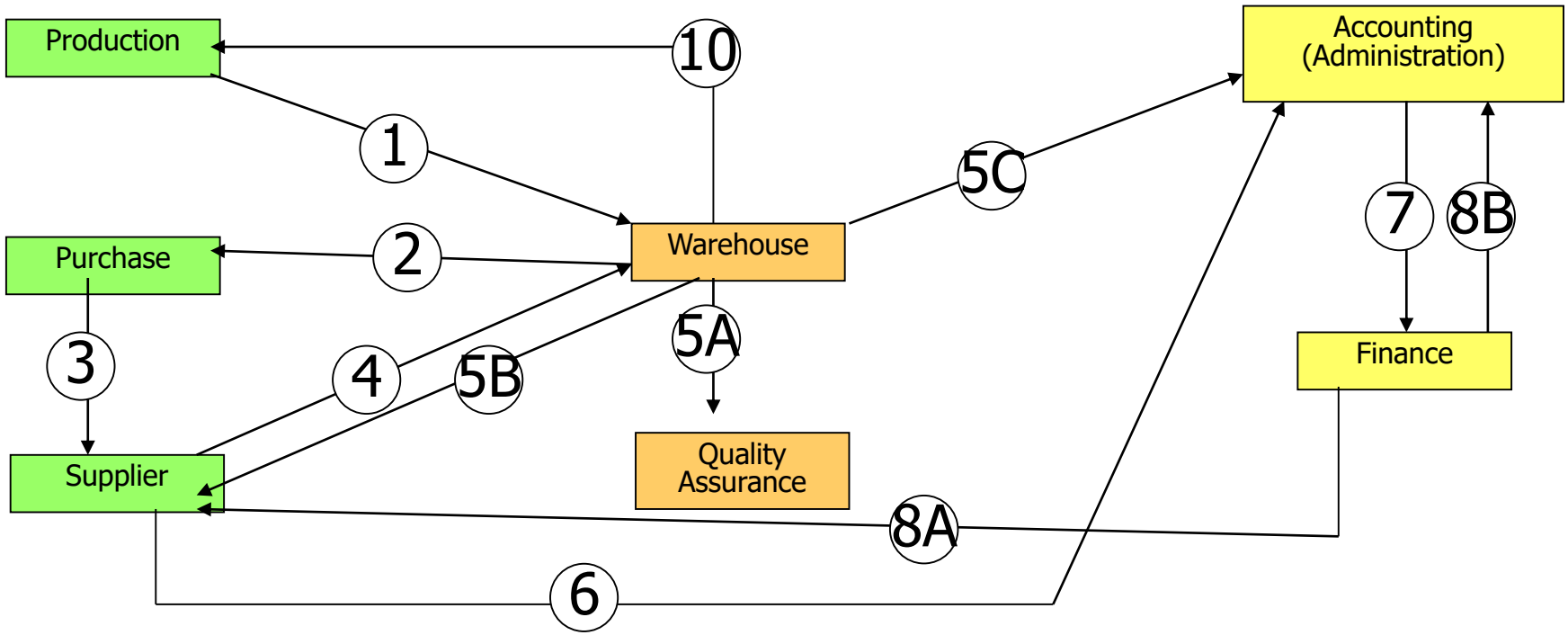
*. Accounting records all steps in the general ledger and in the internal industrial accounting books



8A. Finance execute payment to supplier

8B. Finance informs Accounting of the payment

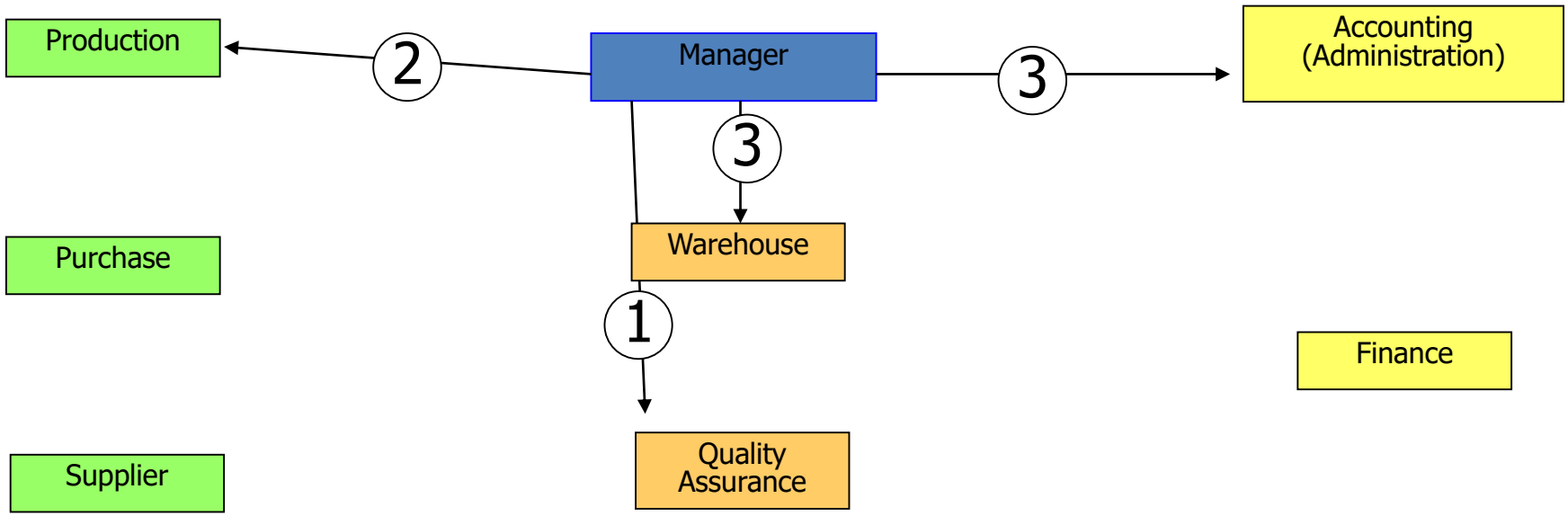
Flow representation



10. The warehouse sends the materials to Production that can start operations.

Flow representation

Decisional process



1. Manager checks the performance of suppliers through QA
2. Manager checks productivity and total provisioning time
3. Manager checks financial trend though periodic reports from Accounting and supply levels from Warehouse

Items to be modeled

- Information: which, exchanged between whom
  - Order, Delivery note, Invoice, ..
- Organizational elements
  - Warehouse, Production, ..
- Activities and their sequence
  - 1 Materials request, 2 ..
- Interaction with the users

IS features

- Transmit information
- Document
  - Performed activities
  - Instructions for the activities to be performed
- Monitoring

- The more people and locations are involved the more an IS is required
  - SME single location: sight navigation
  - Multinational: IS essential

Remarks(1)

- It is a simplified scenario, e.g. because:
  - No request for quotation is sent to different suppliers to select the most suitable one
  - Materials are sent to warehouse and not directly to production, so there is no need to"synchronize" delivery and reception
  - Supplier delivers directly the goods, without using a logistics company
  - The order needs to be delivered at a single location only
  - Purchase office has the sufficient authority to chose by itself the supplier and the price
  - There is not a recording of the physical location where the materials are stored
  - Etc.
- Further complications may stem from the number of currently active orders, the delivery locations, the number of supplier, etc.

Remarks(2)

- Behind an apparently simple operation (ordering raw materials) there are several flows of information both within the organization and outside.
- The management of all the information has high direct costs (the same is true for a “bad” management)
- Controlling all those operations is very difficult in the day by day business of an enterprise, because there is not a single order but hundreds of orders per day with the relative information flows
- The speed of reaction of an enterprise to specific events (e.g. lack of raw materials) can be critical to fulfill customer requests and keep up with the production plans
- These are just a few of the reasons that point towards the need for investment in Information Systems

Remarks (3)

- How to design an Information System?
- How to select the technologies that support it?
- What is the right amount of investment?
- Is it better to have a single integrated system or several applications developed ad-hoc for different needs?
- Is it better to buy software and services from outside of develop them within the organization?

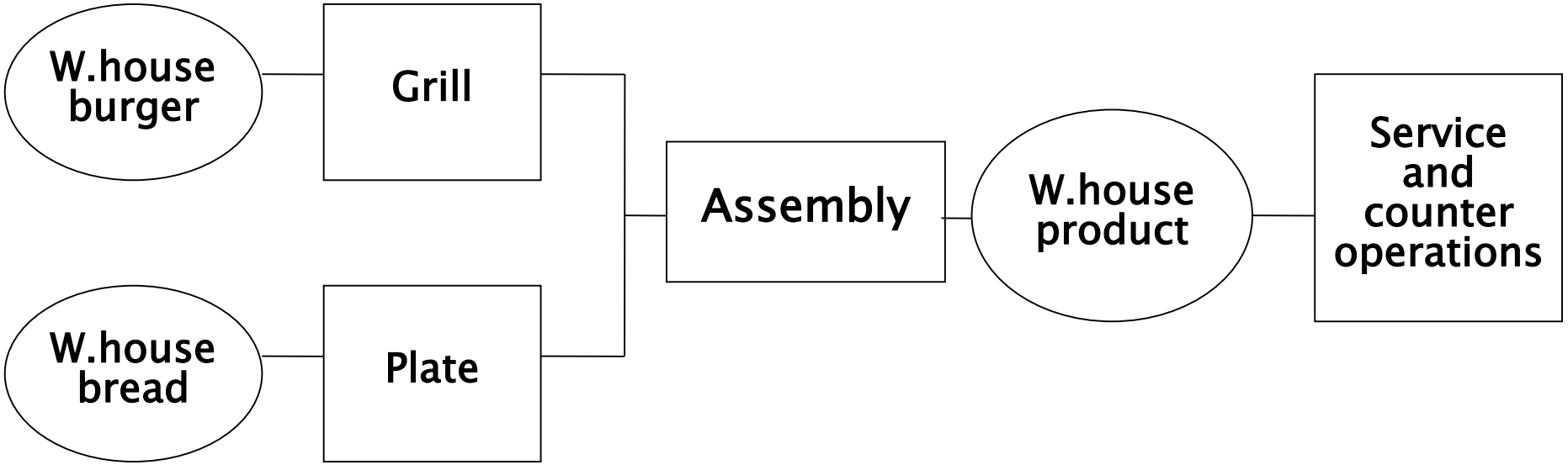
- These are a few of the questions the course aims at anwering.

YET ANOTHER EXAMPLE

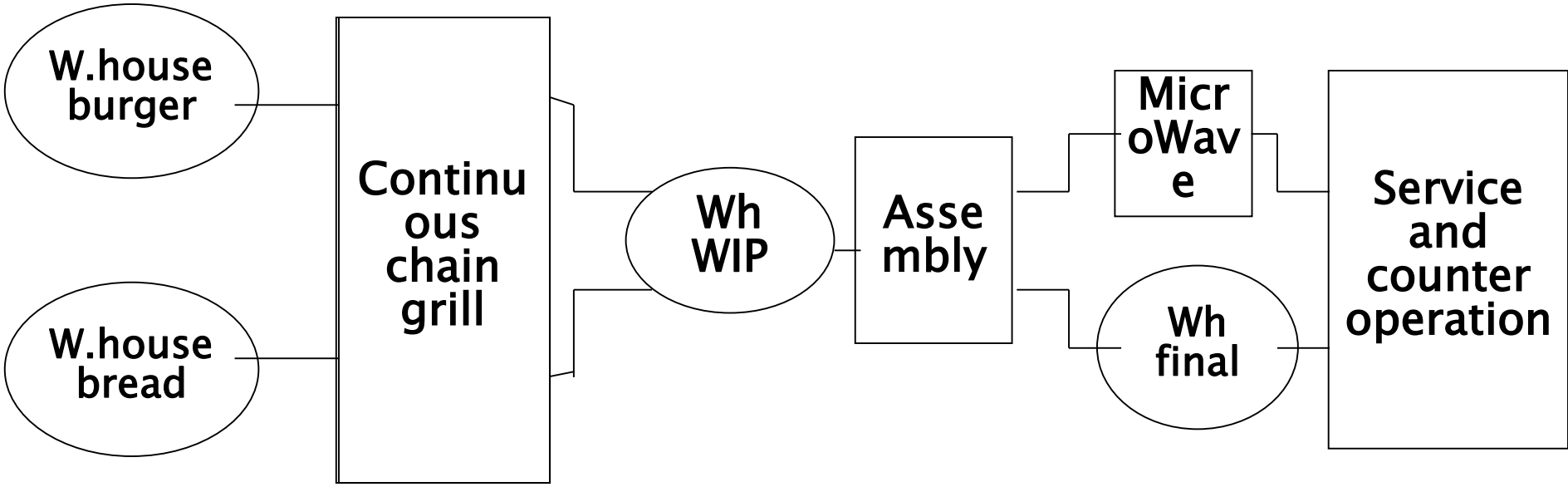
Fast food – information flows

- Goal: constant quality and short waiting time (2-3 min)
- How: few products, standard (fixed production procedure, only 'without' exception allowed e.g. no onion)
  - Basic operations: cook meat, cook bread, assemble

Flow Management: McDonald's



Flow Management: Burger King



Possible choices (1980)

McDonalds'

- 3 types of burgers (large, small, fish), 1 bread type – 6 final products
- Operations: grill burger, heat bread, assembly
- Batch of meat grill (one burger type at a time), Storage pre-assembly + assembled
- Dispose product if not sold within x min.
- Information
  - Orders (which and how many) (monitor in assembly room)
  - Timestamp of production (+ discard) (written on package)
  - Product type (written on package)
  - Customer waiting time
  - Discard proportion
- Decisions
  - Batch (which and how many elements)
  - Number of employee (planning based on sale history)
- Actions
  - Manage exceptions (in assembly, from order)
  - Dispose expired products

Burger King

- 2 buger types (large small), 1 bread – various final products (filling, dressing)
- Operations: grill burger, heat bread, assembly, microwave
- Continous grill (chain), WiP stores, assembly
- Dispose product if not sold within x min
- Information
  - Orders (which and how many) (text slip)
  - Timestamp of production (+ discard) (written on package)
  - Product type (written on package)
  - Customer waiting time
  - Discard proportion
- Decisions
  - Which products in continuous (standard table with amount of sales per hour)
- Actions
  - Manage exceptions (in assembly, from order)
  - Dispose expired products

Alternative choices

- In both cases production is partially disjoint from demand
  - Possible due to standardization
  - Required by short response times
  - Take advantage of slack
- Assembly is linked to demand
  - Takes from intermediate buffers
  - Manages standard and exceptions
  - If not sold must be disposed

Differences: McD's vs. BK

- Type of information:
  - Selling forecast vs. actual demand
  - Flow from counter to production vs. production to counter
  - Quick delivery vs. client wait
  - Usage of WiP storage vs. production just-in-time
  - Standardization vs. customized production
  - Stability vs. variability of deman in time
  - Variability vs. stability of work force
  - Procedural execution vs. decisional capability of employees
  - Characeristics and habits of customers
  - …..

CHARACTERISTICS OF INFORMATION

Data vs. information

- Information
  - Data that have been shaped into a form that is meaningful and useful to human beings in processes such as decision making
- Data
  - Streams of raw facts representing events occurring in organizations (e.g. business transactions) or the physical environment before they have been organized and arranged into a form that people can understand and use

Characteristics of information

- Intangible/immaterial resource
- It is not destroyed by used (possibly loses value with time)
- It has null marginal production costs; this fact lies at the basis of the diffusion, usage and creation of new information
- Its usage is associate both to the whole organization and to the tasks performed by individuals.

Characteristics of information

- In organizations there are both information scarcity and information overload
- The problems concern all the life cycle: acquisition, storage, retrieval, usage (individual vs. shared) etc.
- There are information obsolescence / perishability risks that affect its change of value in time

Information Management

- Activity automation
  - Focus on productivity and substitution of work with tech capital
    - E.g. reception of paper invoice from company B, data entry in IS of company A
    - Automation 1: scanner and OCR for invoice reception
      - Tech capital (investment): scanner and OCR system
      - Work: data entry
    - Automation 2: invoice as standard e-document (EDI)
- Decision support systems (EIS, MIS, etc.)
  - Get the largest amount of information available as a basis to take decisions
  - Evaluate in the quickest and most precise way a high number of alternative decisions

Information Management

- Embedded in products and/or services:
  - Banking services
  - On-board systems for cars
- Infrastructural and for external relations
  - Intranet and extranet
  - EDI

Information costs and benefits

- Information management has measurable costs
  - Acquisition of hw and sw, personnell training, management
- It is more difficult to determine the nature of the benefits deriving from the IS investments
- Such benefits have different natures and more and more concern process automation and/or cost reduction
- Nowadays the reduction of transaction and decision cost represents one of the central aspects of IS investments

VIEWS ON IS

View points on IS

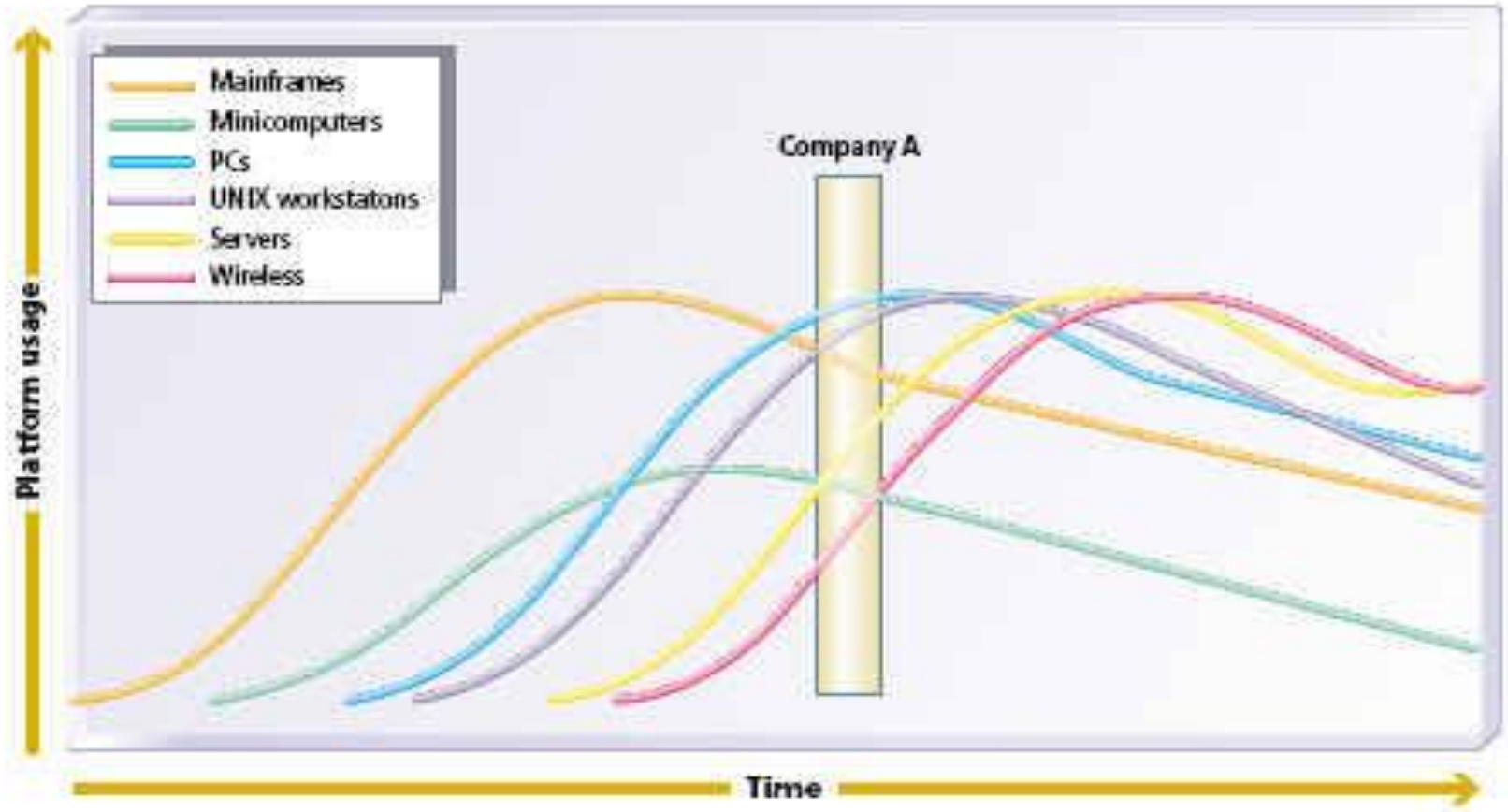
- There are several view points in the analysis and design of IS
  - Evolutional: how to follow the evolution of technologies and of the organization
  - Technological: tech components, architectures, performance, etc.
  - Functional: which applications for which business function
  - Organizational: how it affects organization, processes, individual competencies, etc.

View points on IS

- Design: how to design and implement IS
- Transactional: how to manage economic transactions (internal and to outside)
- Economical: effects on the structure of costs and / or on the productivity
- Decisional: support tool for decisional processes
- Management: who is in charge and how it is located in the organiztion, how investments are planned and realized.

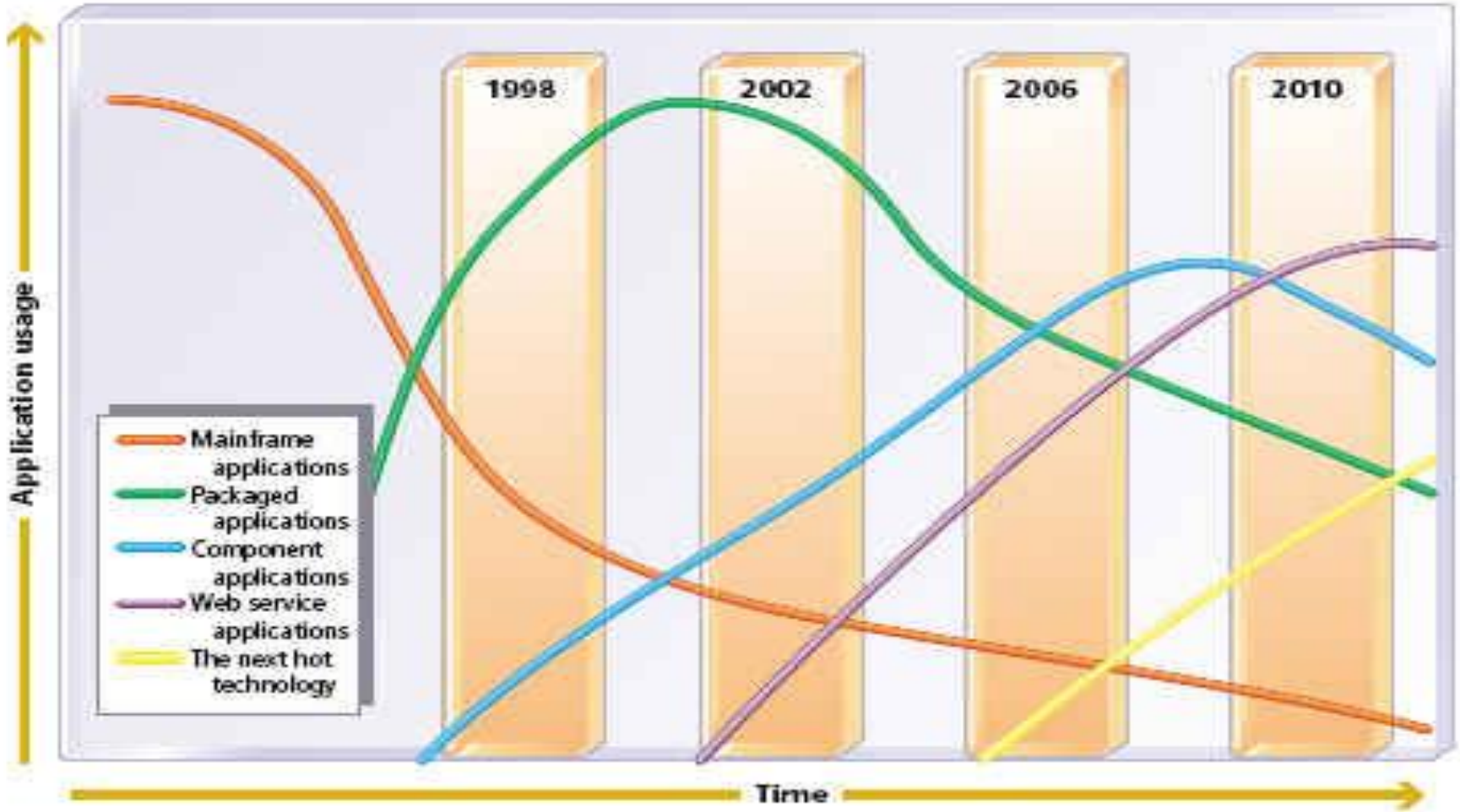
Evolutionary view point

FIGURE 1: SUCCESSIVE WAVES OF TECHNOLOGY



Evolutionary view point

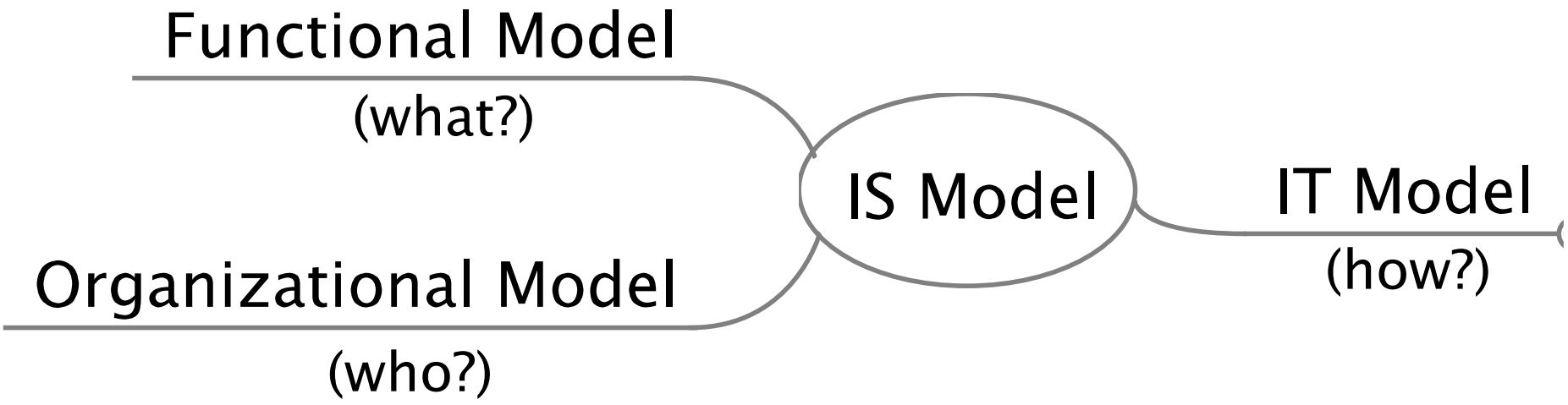
FIGURE 5: SUCCESSIVE TECHNOLOGY ARCHITECTURES



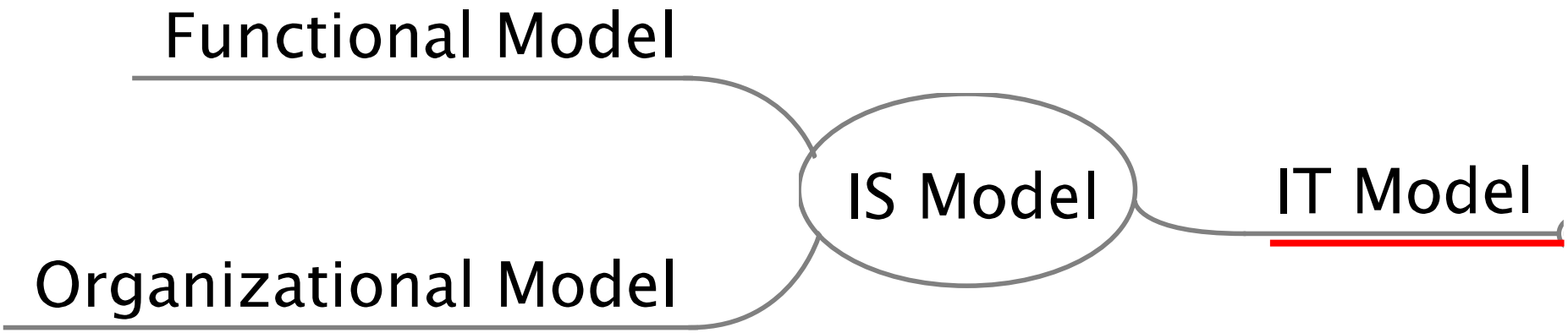
Common buzz

- Technology:
  - The “last version syndrome”
  - The “Modern Times syndrome” (emphasis on automation of often irrelevant operations)
  - The “Internet syndrome” (need of a web site)
  - The “CRM syndrome”
  - The “App syndrome”
- Economy:
  - “it doesn’t interest me much / it is not relevant”
- Efficacy and ease of use:
  - “The user must learn how to use it and not resist the change”

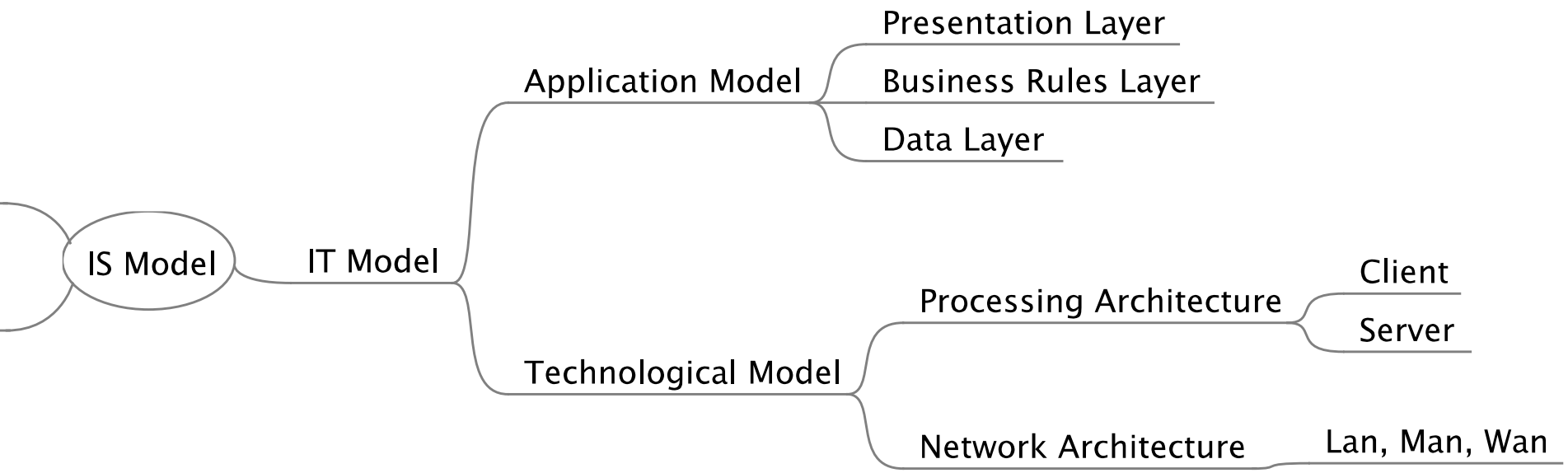
Analysis model for IS



IT model



IT Model


IS Model
IT Model
Application Model
Presentation Layer
Business Rules Layer
Data Layer
Technological Model
Processing Architecture
Client
Server
Network Architecture
Lan, Man, Wan

IT Model

How IS are built

Two main models:

- Application Model: describes the software architecture
- Technological Model: describes the hardware architecture

Application Model

- IS as software at application level,
- Typically with three layers
  - Presentation
    - Interaction with end user via GUI (or character based forms)
  - Business rules
    - Algorithms and rules to process, control and extract data
  - Data
  - cfr. three tier architecture in technological view

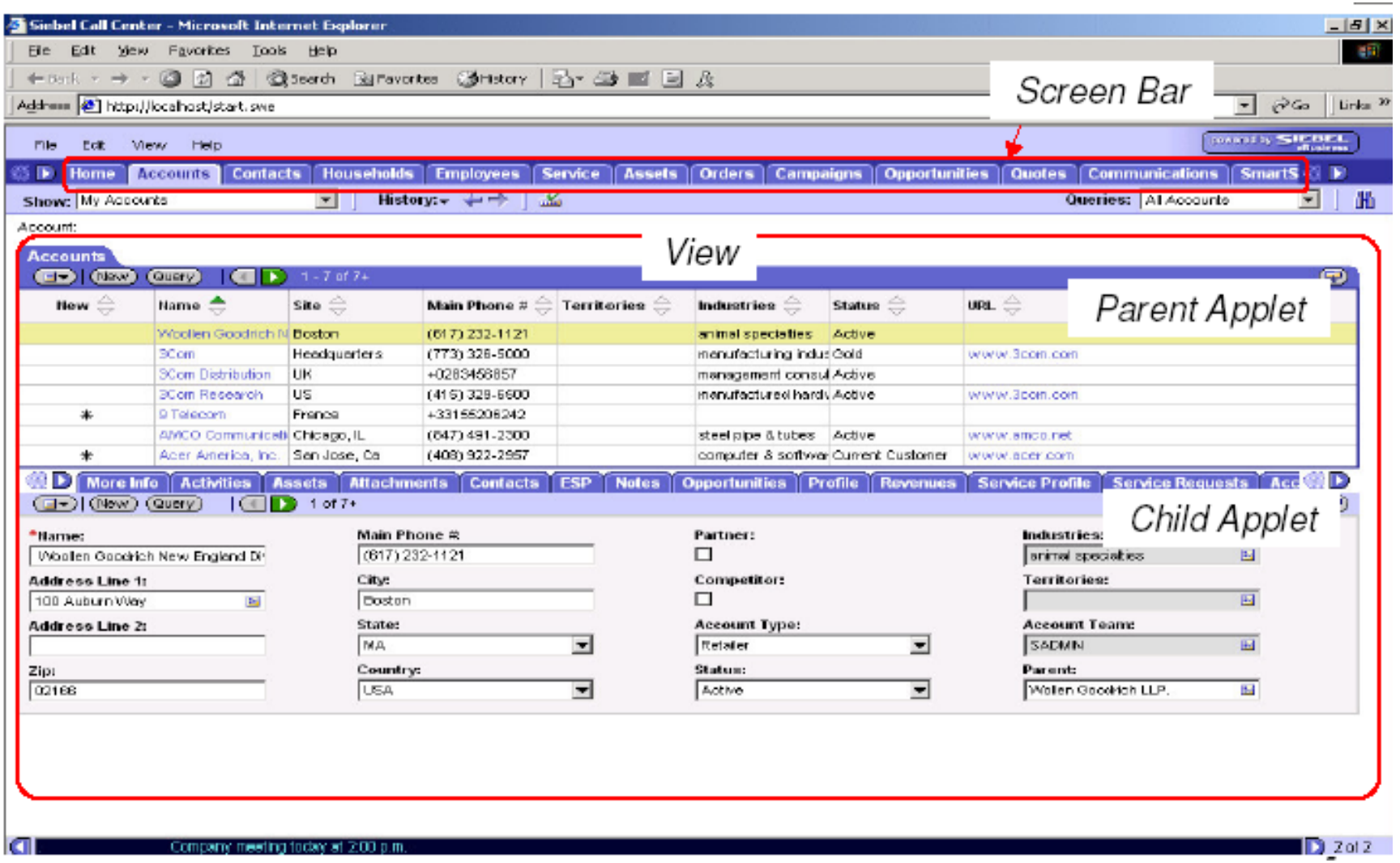
Example

Presentation layer	Rule layer	Data layer
Show GUI screen "Withdrawal request": Acquire data entered by the customer	IS the required amount between the valid thresholds	Access to data tables and read thresholds
Show a message "Correct/Cancel"; Acquire data from customer	If the request is not valid require to correct or cancel; if then the input is cancel, stop processing, otherwise read the value of the account	Access to data tables and read values
Show a message; Acquire data from cclient	If the request is greater than the account ask to correct or cance and re-read the value; if then the choice is to cancel stop processing, otherwise update the account value	Access to data tables and change values

Presentation layer

- An interactive application communicate with the user through a GUI (Graphical User Interface) and different inputs (e.g. keyboard, mouse)
- GUI both show and record data
- The form of the interface should reflect the needs and functions of each individual user

Ex: presentation, customer data



Business Rules Layer

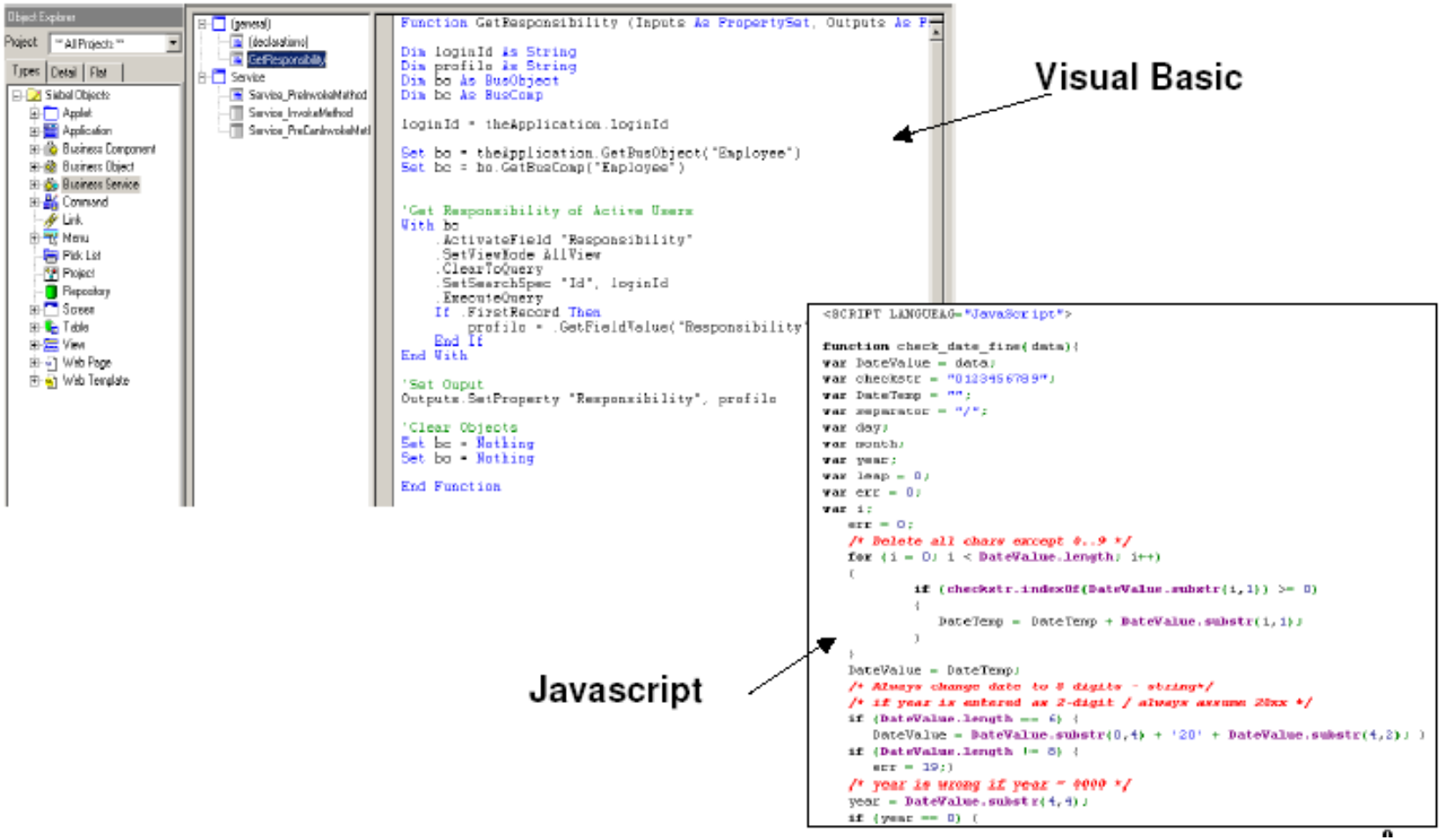
Rules consitute the logic driving the processing of data entered in the IS through the Presentation layer

Rules interact with the presentation and/or the data layer

Rules may include:

- Computations (eg. computing the average)
- Logical operations (eg. comparison)
- Data analysis (eg. a chronological list)

Ex: business rules



Data layer

- The data base is a permanent storage of data organized according to a schema
  - E.g. Oracle, MySQL, Access
- The selection of data to be stored is linked to the organizational needs and may imply various costs

- Question: how to select the database technology?

Technological model

- IS as hardware systems and their connections
- Client server architectures
  - Two tiers
    - Data + application server;
  - Three tiers
    - Data server, application server (business rules), presentation server
  - …

Processing architecture

- Mainframe + dumb terminals
  - Until 80s
- Client server
  - Current mainstream
- Peer to peer
  - Not much widespread in IS
- Cloud
  - The next wave

Mainframe

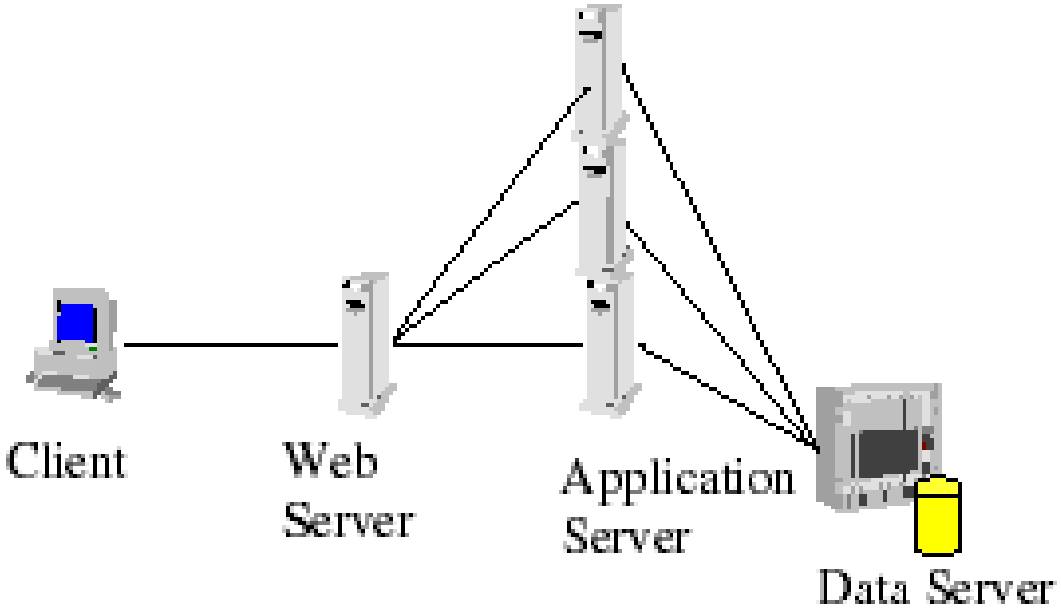
- Extremely powerful computer (mainframe) where all three layers reside
- Terminal performs only I/O

Client-server(C/S)

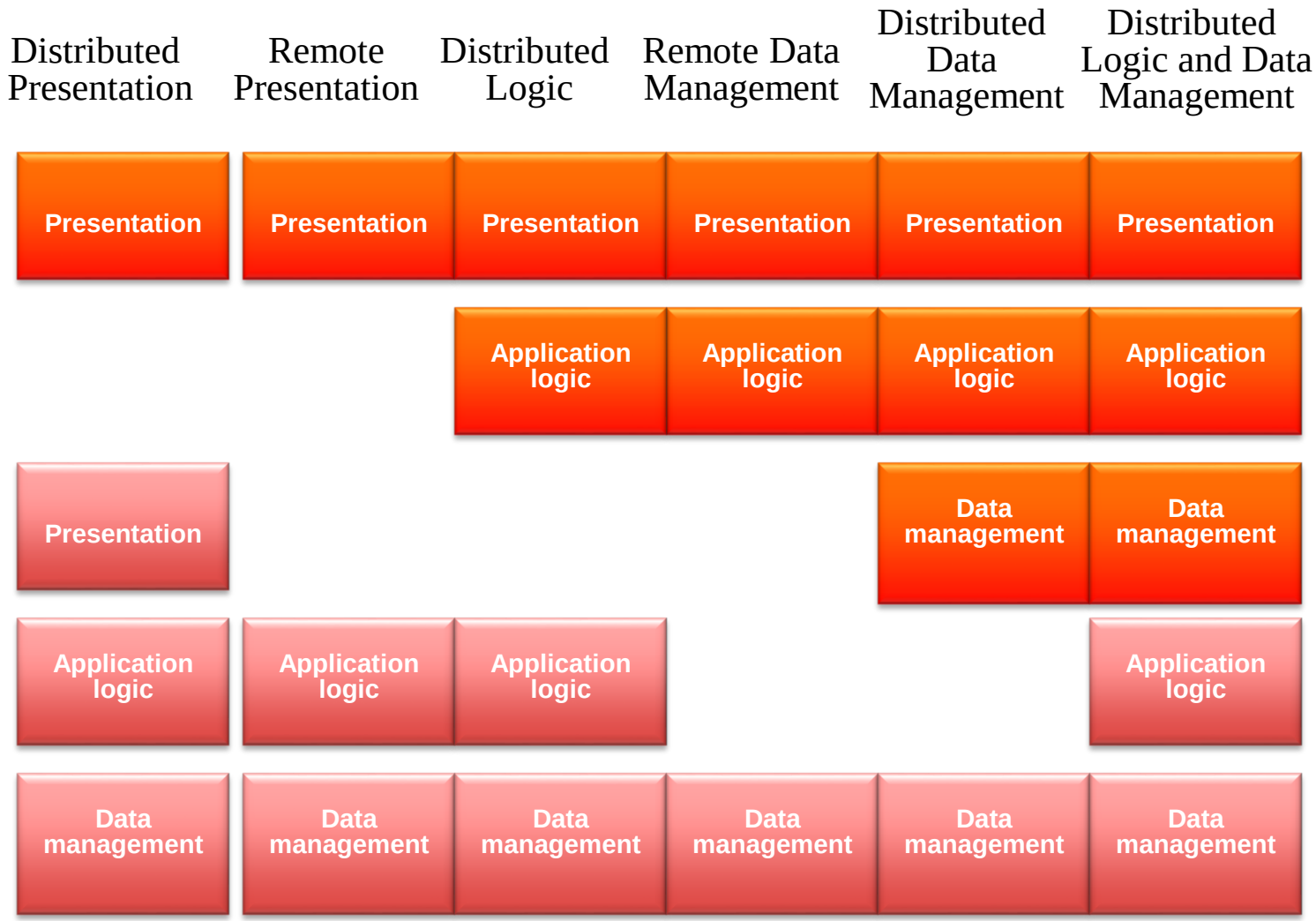
Architecture where client processes request services offered by server processes

- Client system: typically running on wide range of devices (e.g. work station, smartphone, tablet) where a portion of the presentation layer reside
- Server system: hosting the rule processing (application server) and data management (data server)

Three tiers



CS – fat to thin client



Cloud Computing

- Ubiquitous, cheap, on-demand access to a shared pool of configurable computing resources
- It relies on sharing of resources to achieve coherence and economies of scale
- Shift model from CAPEX to OPEX
  - Third party infrastructure

Quality requirements

- A processing architecture must satisfy a few basic requirements:
  - Reponse time: the interval between the request and the display of the response; depending on the application the system shall be more or less reactive (e.g. ATM vs. electricity meter)
  - Scalability: the work load a system is able to sustain, typicaly expressed in number of concurrent users
  - Availability: percentage of time the system is working (typical SI should be around 99.95%)
  - Etc.

Network architectures

The distinct systems of a processing architecture communicate by means of networks that transmit digital information

Network taxonomies

- By extension
- Hierarchical levels
- Working mode

Network levels

According to the level they can be:

- Access
- Backbone
- MAN

Network extension

- LAN *(Local Area Network),* range few km, bandwidth 10–100 M bps
- MAN (*Metropolitan Area Network),* urban area range, bandwidth 100 M – 1 G bps
- WAN *(Wide Area Network),* regional or national range, bandwith 1 T bps.

Network working mode

Three main working modes:

- Internet
- Intranet: private network within an organization, used to share information inside it
- Extranet: portion of intranet that a company open to customers and external users

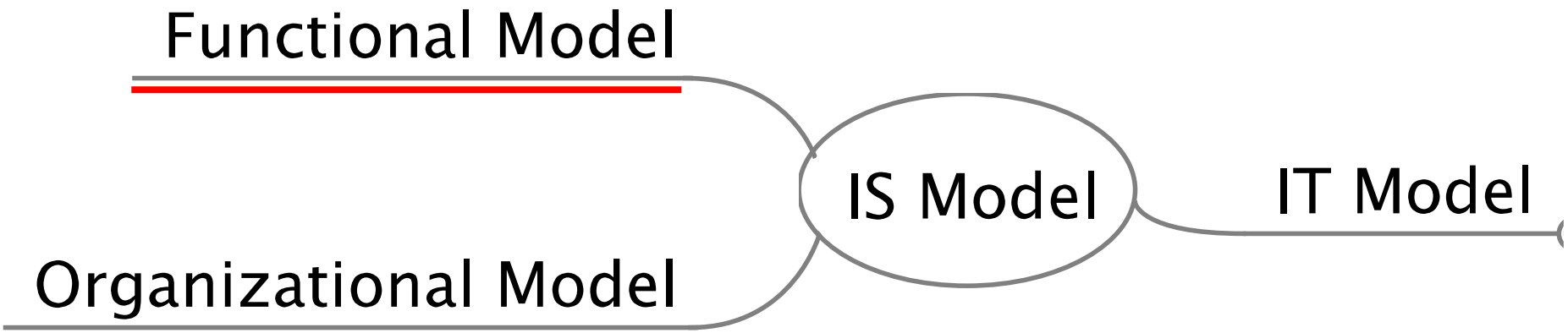
IT selection

- The selection of the IT model takes into consideration costs, performance, sizing etc.
- Looking at the technology evolution allows considering long-term costs
- Other analysis dimensions include the growth perspectives of the organization

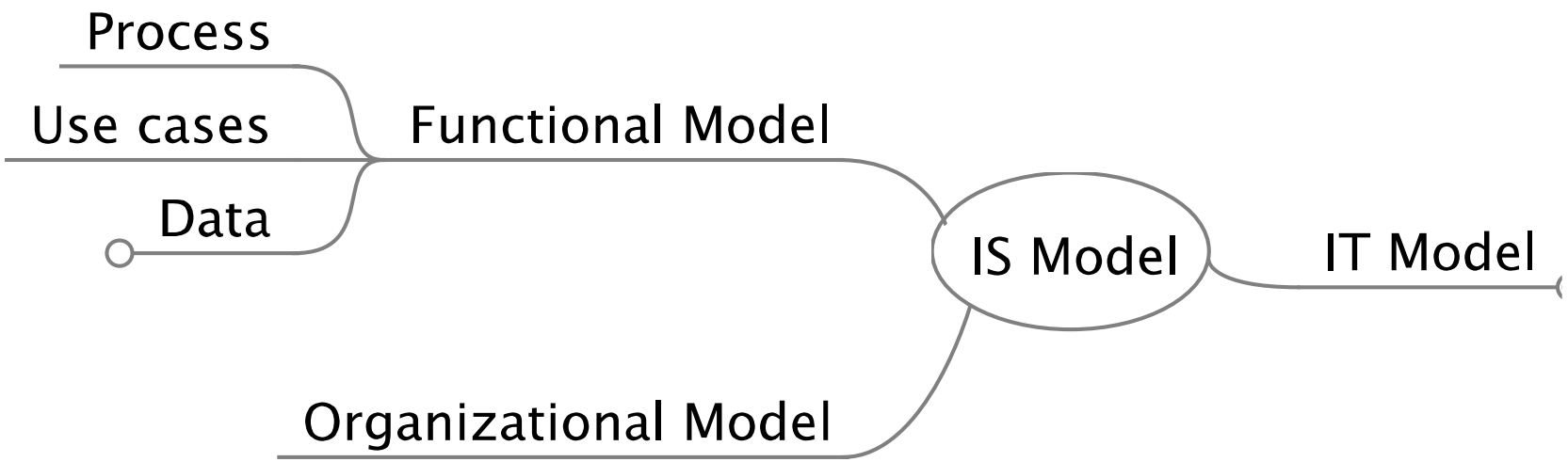
Enterprise architectures

- Zachman Framework, www.zachmaninternational.com
- TOGAF, www.opengroup.org/togaf
- DoDAF, www.architectureframework.com/dodaf
- Capgemini's Integrated Architecture Framework, www.capgemini.com/services-and-solutions/technology/soa/overview
- US Federal Enterprise Architecture, www.whitehouse.gov/omb/e-gov/fea

Functional model



Functional model



Functional Model

What should the IS do, abstracting from how it can be done (IT model)

Processes

- Activities, functions
- (CRASO, BPMN, UML activity diagram)

Data

- UML class diagram, Entity Relationship diagram

Interaction

- Use cases

Functional model

- High level description
  - CRASO
- Detailed description
  - Activity diagrams, class diagrams

Process

- Business Process
  - Set of activities characterized by:
    - Input / output
      - material, information, knowledge
    - Role
  - With objective of producing valuable product or service

Processes

- It is possibe to automate processes and increase efficiency, but not necessarily the efficacy

- Focus:
  - Better understand which processes need to be improved
  - Not to automate processes just for the sake of automating

IS for process support

- CRM
  - Customer relationship management
- SCM
  - Supply chain management
- Enterprise systems

CRASO Model

IS as tool to manage information related to business processes, which can be regarded as a flow or linked activities

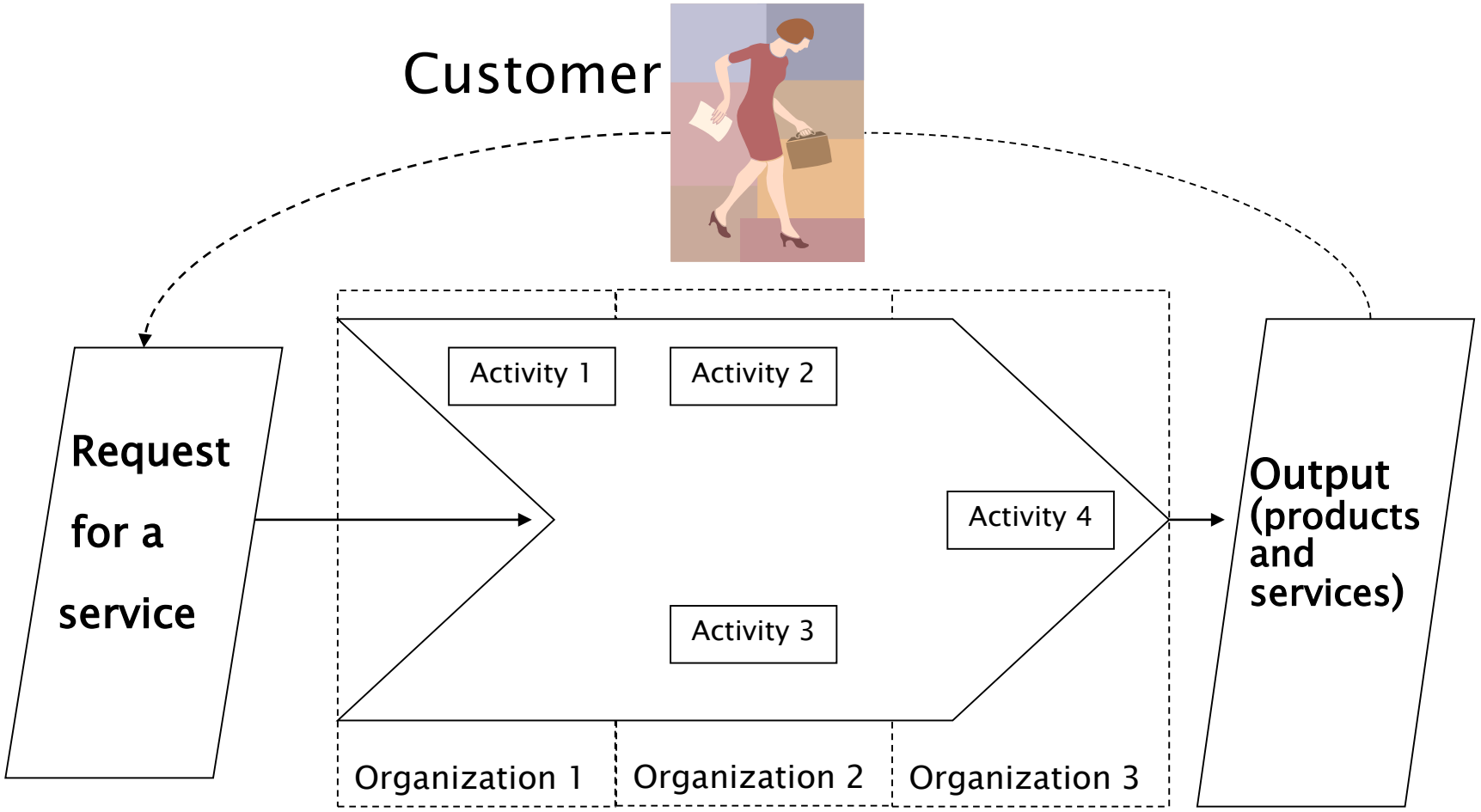
A process can be defined as:

- A sequence of activities
- Performed by one of more organizations in different locations using a set of resources
- On material / immaterial objects
- Addressing the service / product requests from one or more customers
- That product products/services both material and immaterial

CRASO Model

- Business process = CRASO
  - Customer
  - Request
  - Activity
  - organiSation
  - Output

CRASO


Customer
Request for a service
Activity 1
Activity 2
Activity 3
Activity 4
Output (products and services)
Organization 1
Organization 2
Organization 3

Process span

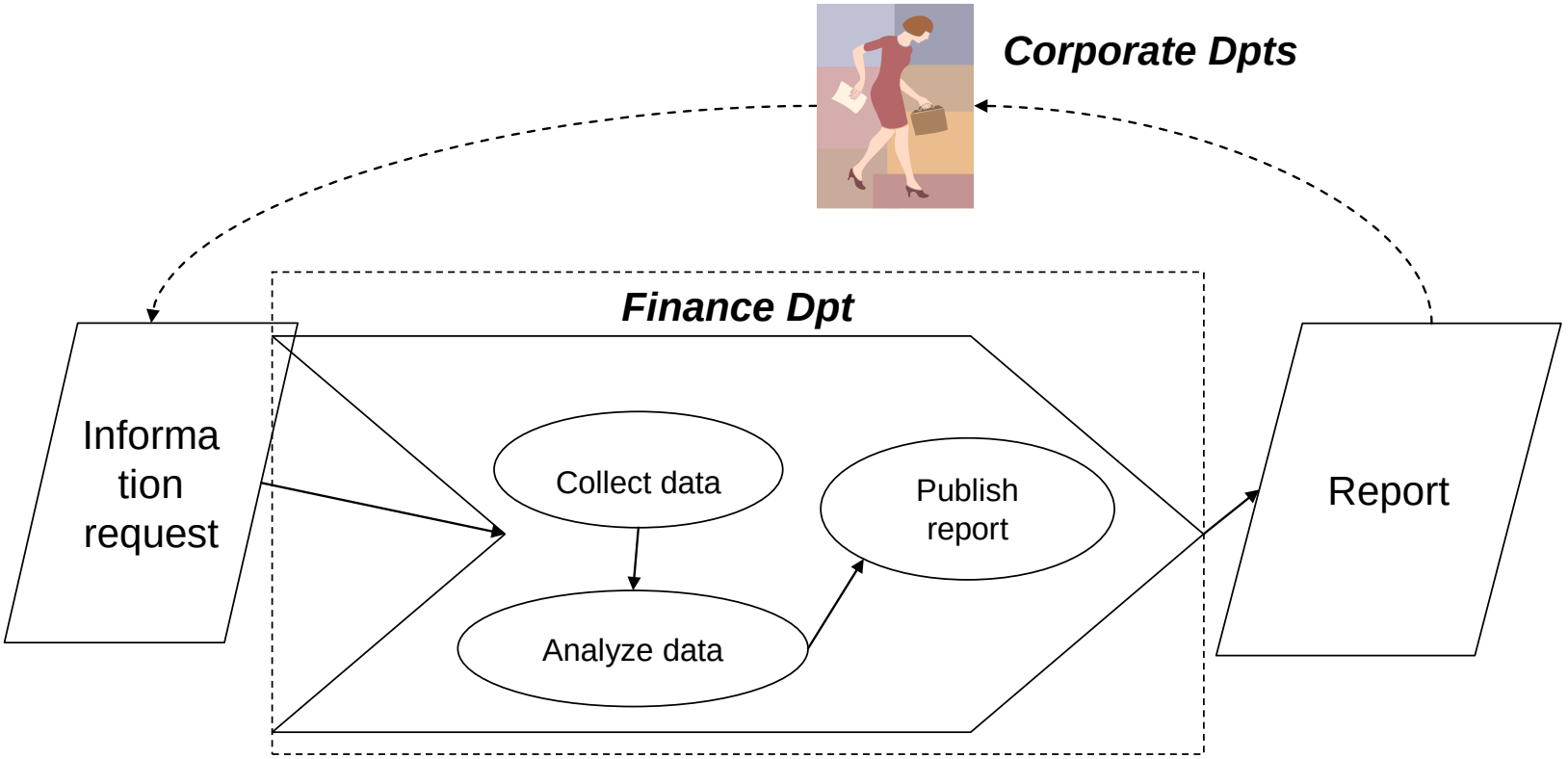
- Mono-functional
- Inter-functional
- Inter-organizational

Processes – intra function

TABLE 2-6 EXAMPLES OF BUSINESS PROCESSES

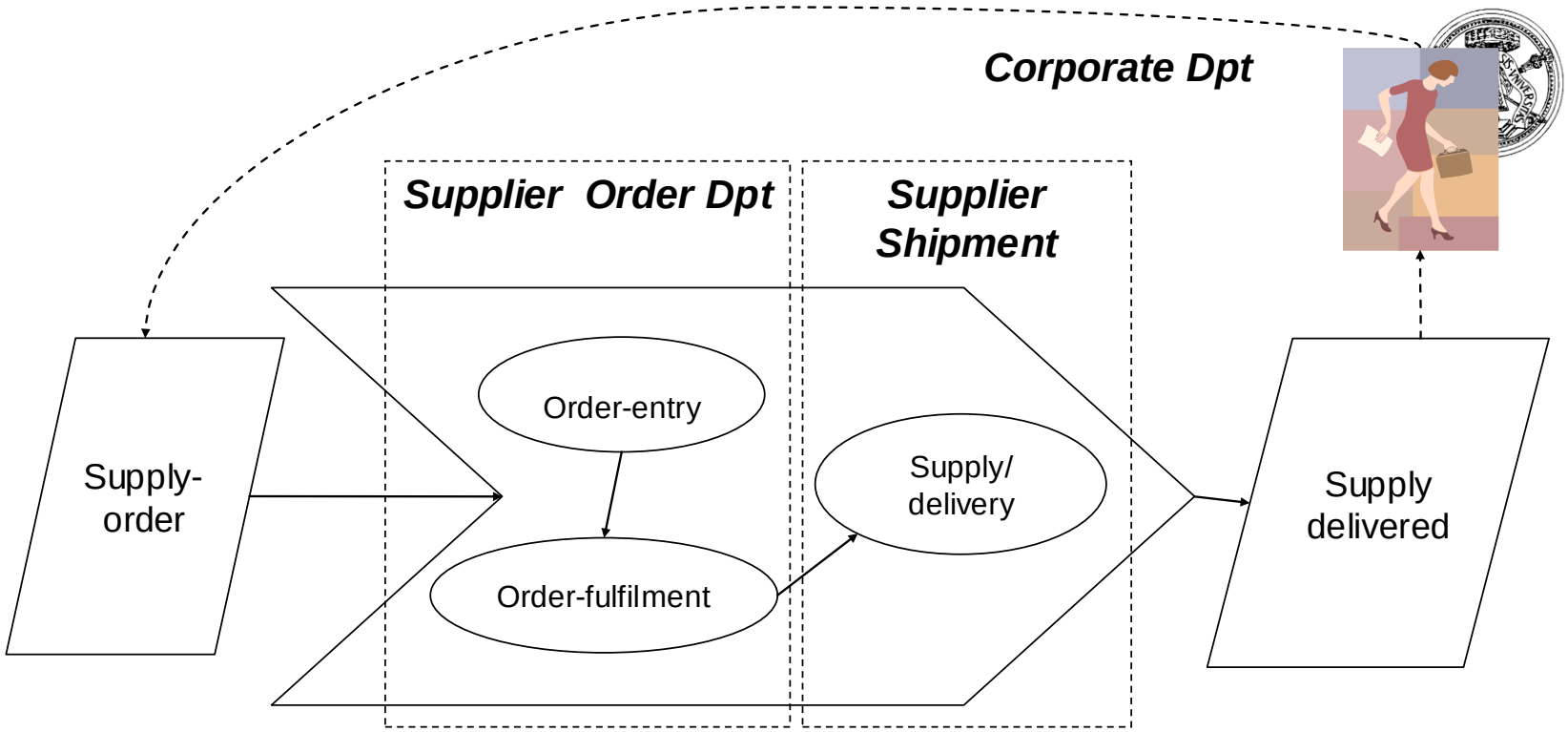
Functional Area	Business Process
Manufacturing and production	Assembling the product
	Checking for quality
	Producing bills of materials
Sales and marketing	Identifying customers
	Making customers aware of the product
	Selling the product
Finance and accounting	Paying creditors
	Creating financial statements
	Managing cash accounts
Human resources	Hiring employees
	Evaluating employees' job performance
	Enrolling employees in benefits plans

Mono-function process



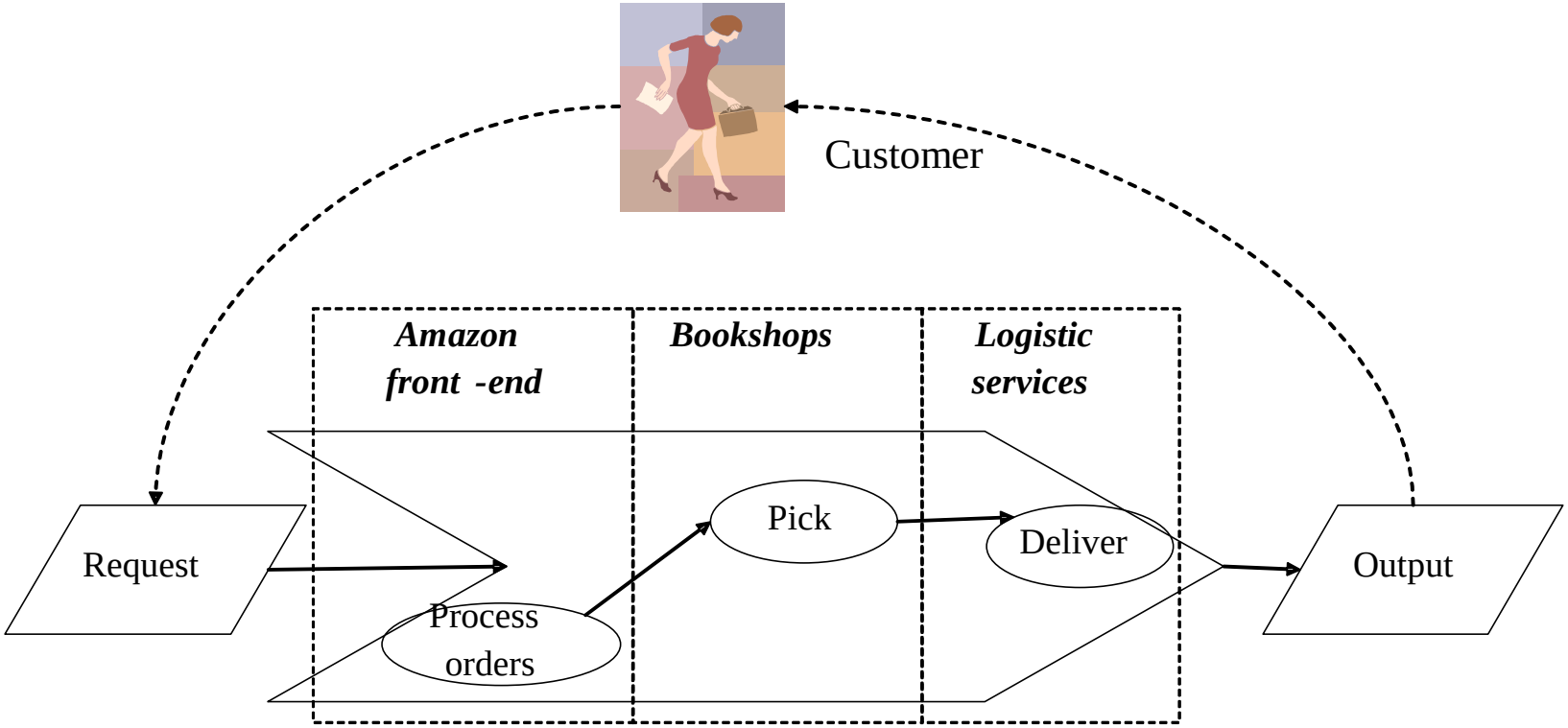
Business Process	Customer	Request	Activities performed (summary)	Organizations involved (summary)	Output (summary)
Management reporting	Corporate Departments	Information request	Data-collection Data-analysis Report-publication	Finance	Report

Inter-function process



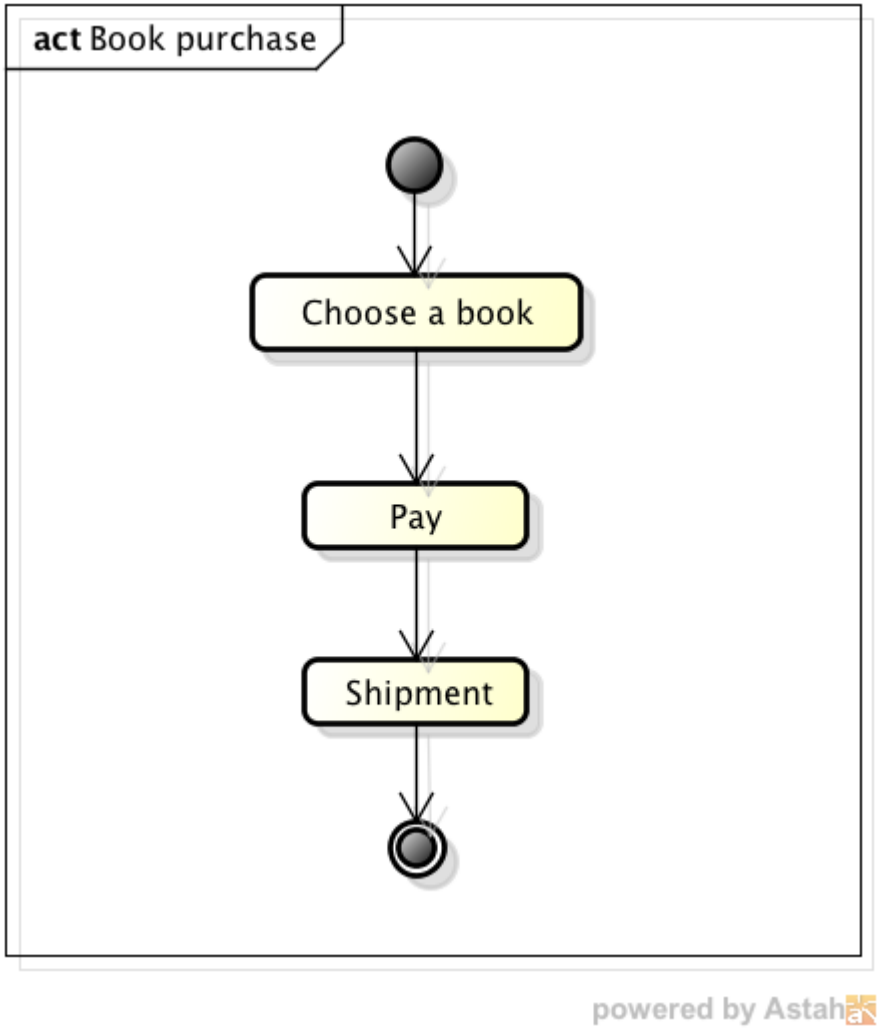
Business Process	Customer	Request	Activities performed (summary)	Organizations involved (summary)	Output (summary)
Production Planning	Sales-dpt	Production-request	Assemble-production-plan, Give-information, Negotiate and execute the plan	Production-planning-dpt, Materials-management-dpt, Factories	Approved production plan

Inter-organization process

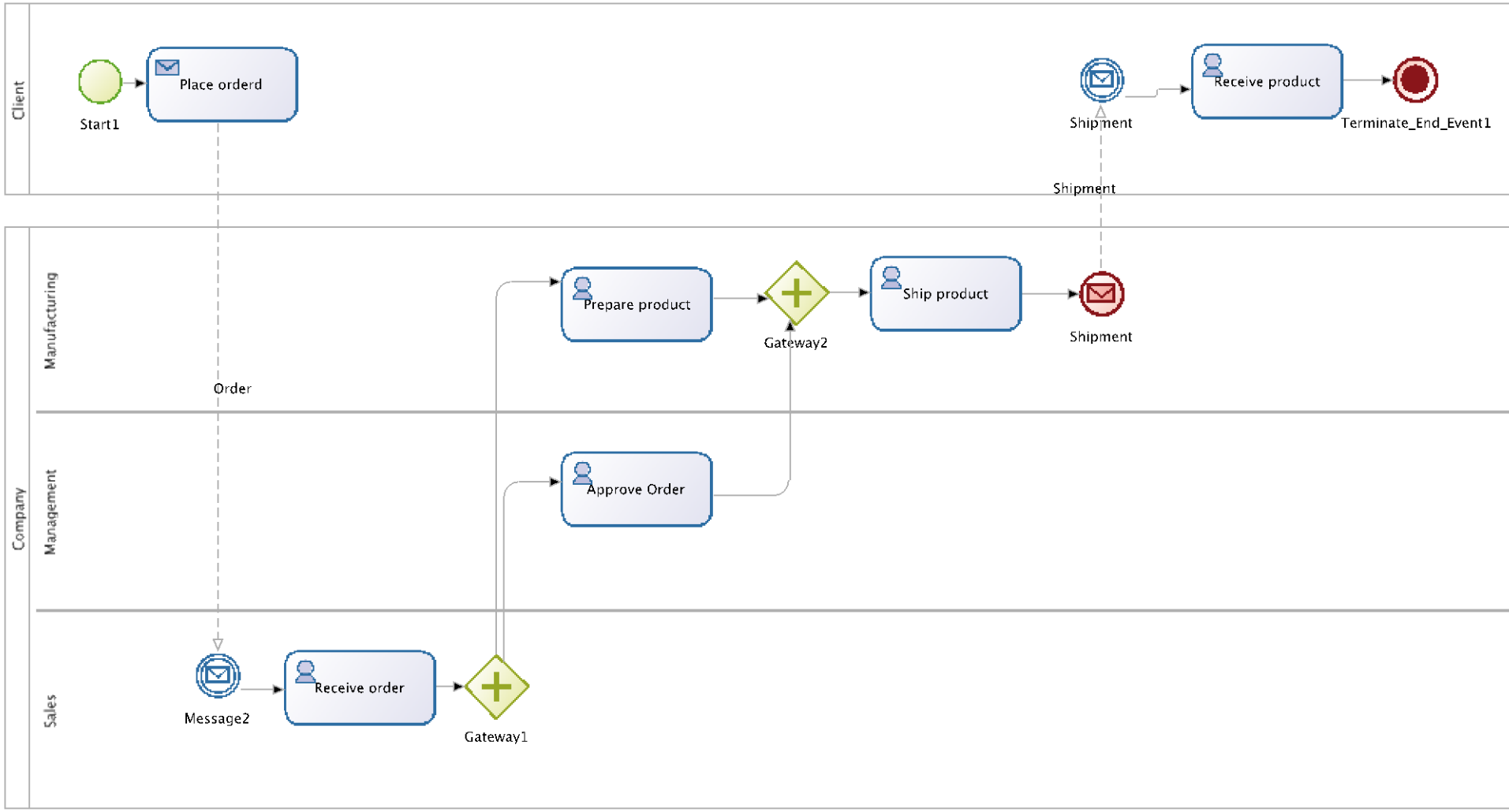


Customer	Request	Activities performed (summary)	Organizations involved (summary)	Output (summary)
Private customer	Book order	Process -order, Order -picking, Book-delivery	Front -end, Bookshop, Logistic services	Delivery of books

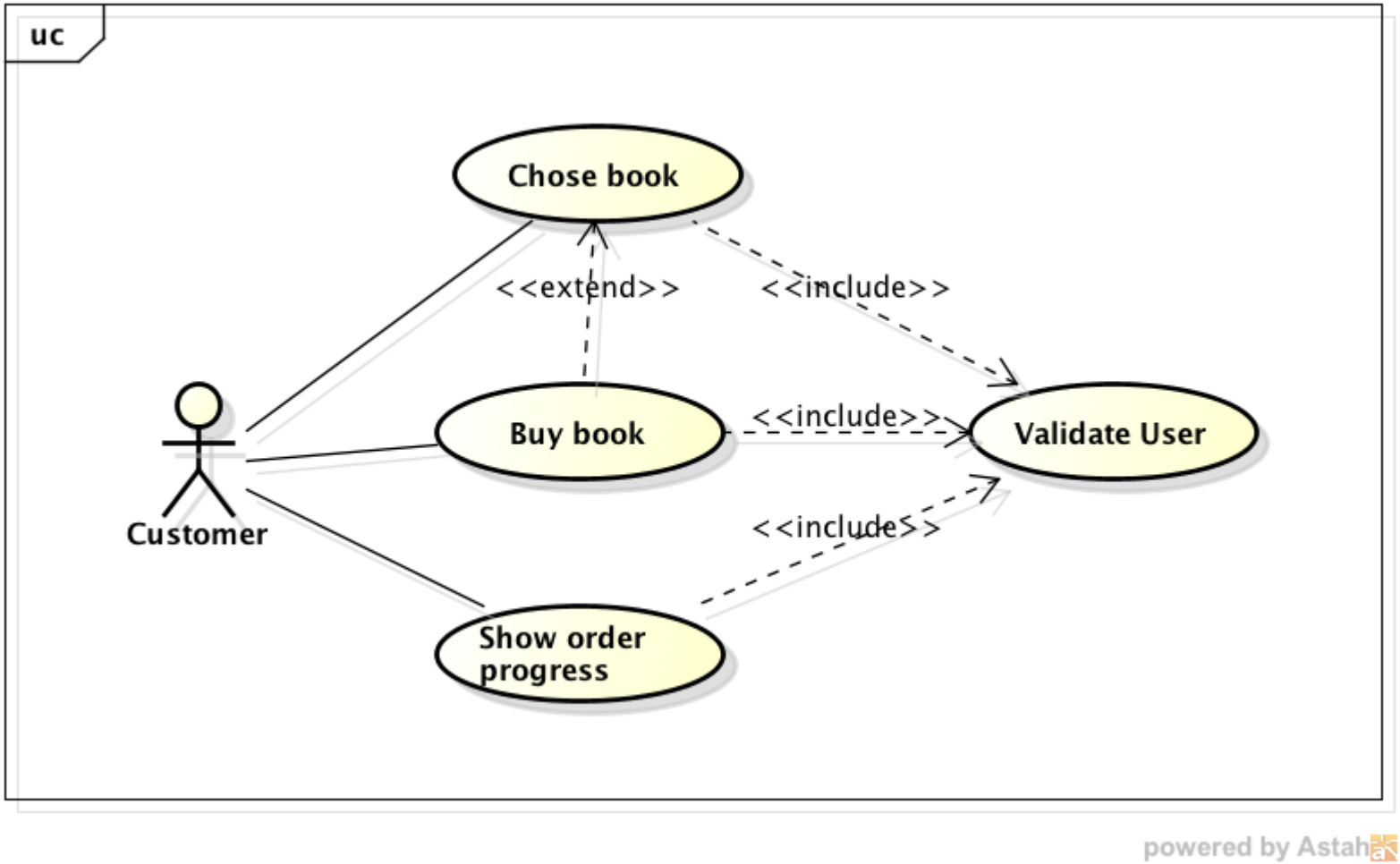
Book purchase: process model



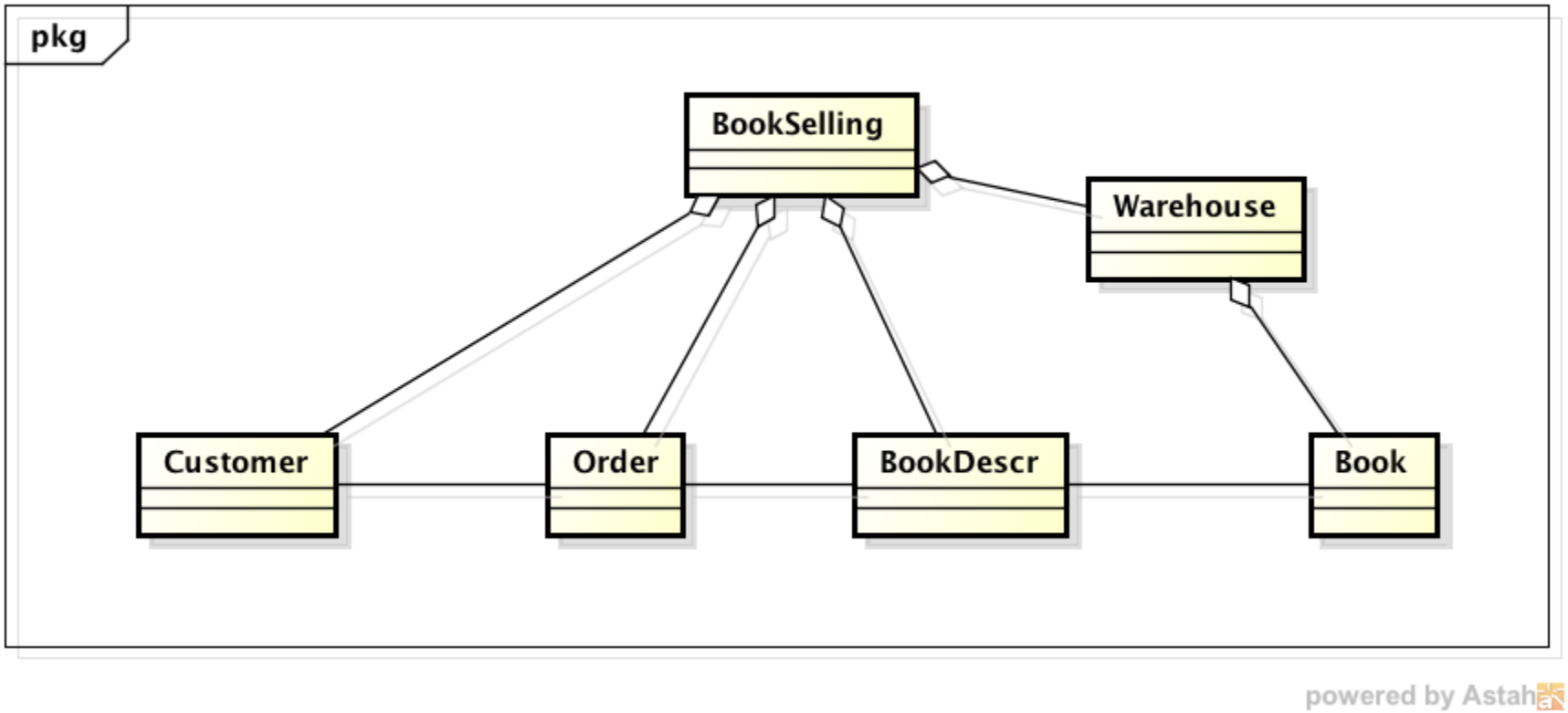
Process view



Use cases


uc
Chose book
<<extend>>
<<include>>
Buy book
<<include>>
Validate User
Customer
<<include>>
Show order progress
powered by Astah

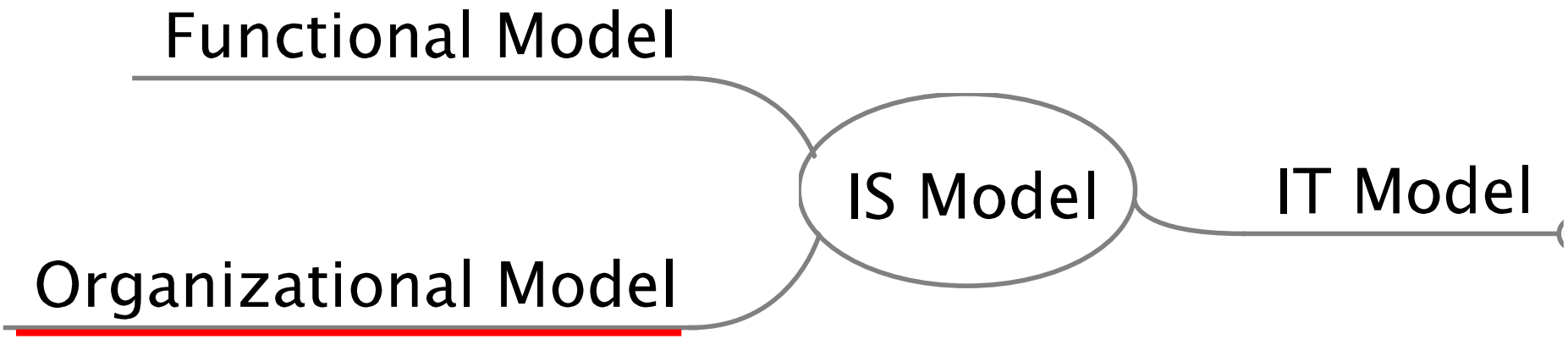
Book purchase: conceptual model



Conceptual model

IS type	Master data	Dynamic data	Indexes
Warehouse management	Materials Locations	Storage Turnover	Turnover Storage
Bank account	Customers Accounts	Account balance Account turnover	Turnover Customer balance
Gas accounting	Customers Price table	Consume Payment balance	Consume stats Customers
Customer order processing	Products Customers Price table	Orders Product store	Customer prefs Customers
Public services	Citizens Certificates Price tables	Certificate requests	Services Citizens

Organizational model



Organizational view

- IS as service offered to organizational level (and group) of organization

Organizational model

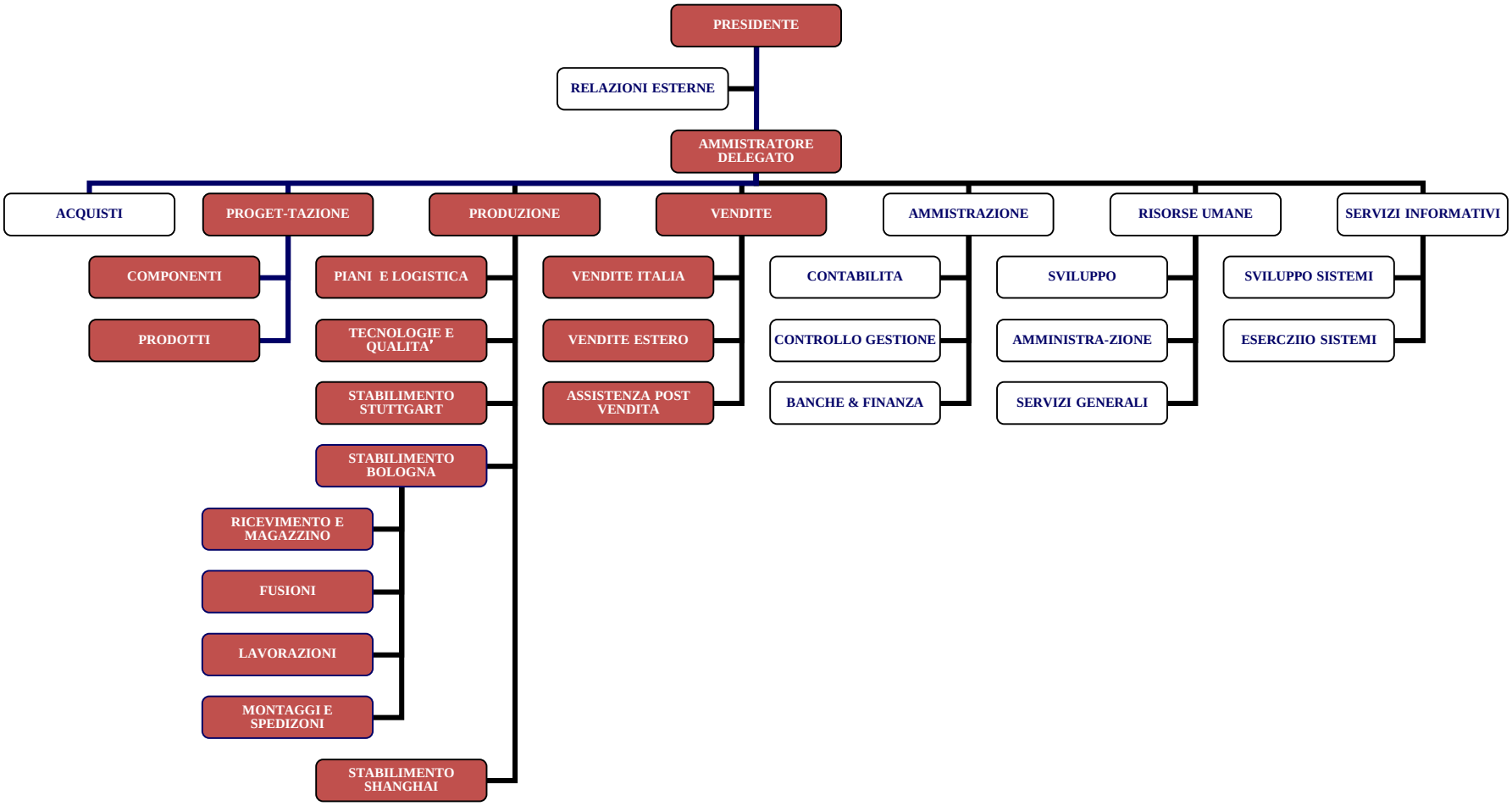
- IS as a servide offered to a business unit or group
- Organization =
  - Group of people gathered for a common purpose
  - Command and control structure that manages operational processes

Organizational models

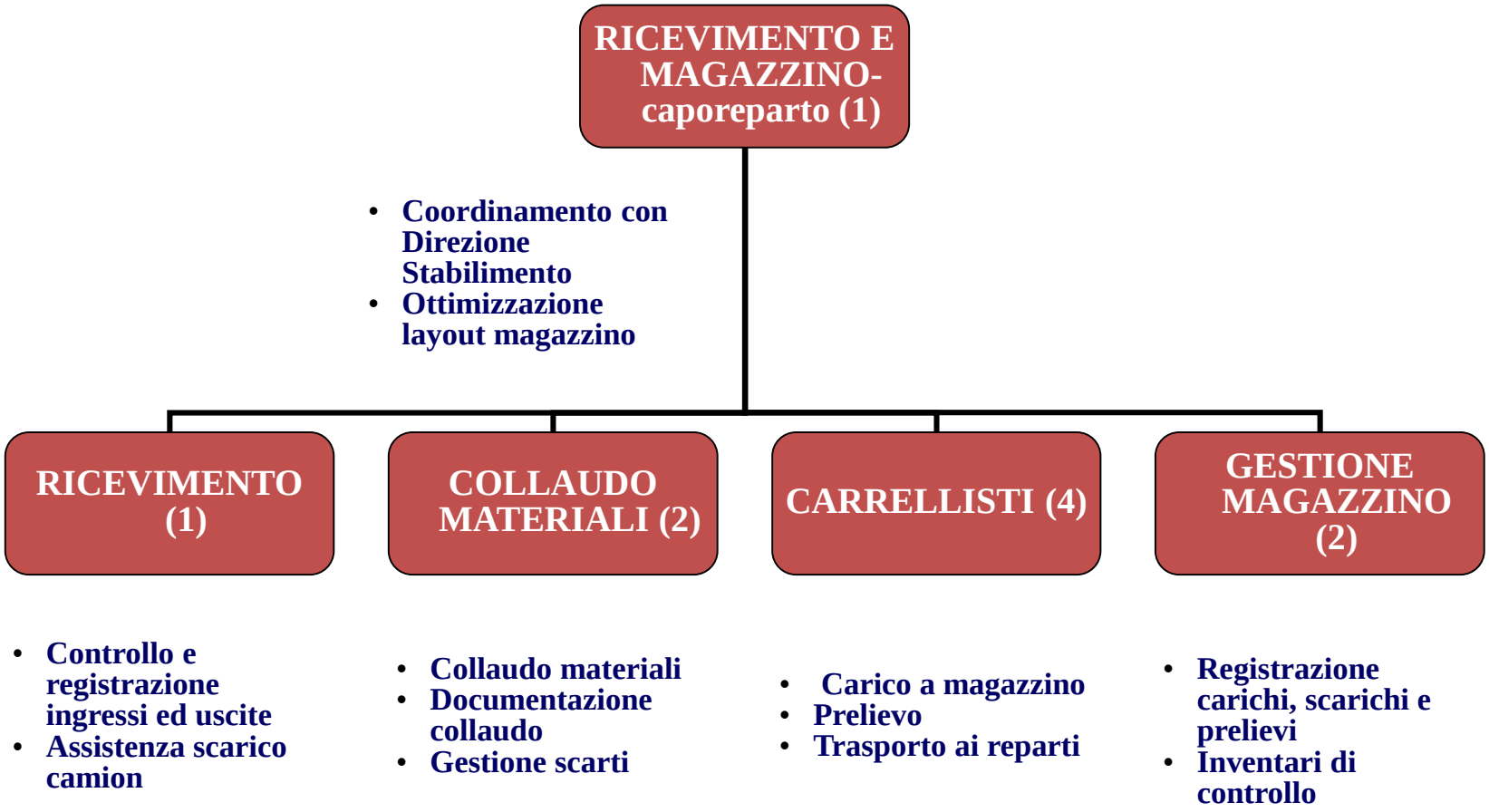
- Organizational chart
  - Macro level
  - Micro level
- Linear Responsibility Chart (LRC)
- Swimlane (in activity diagrams UML)

Organizational chart

Organizational chart – macro



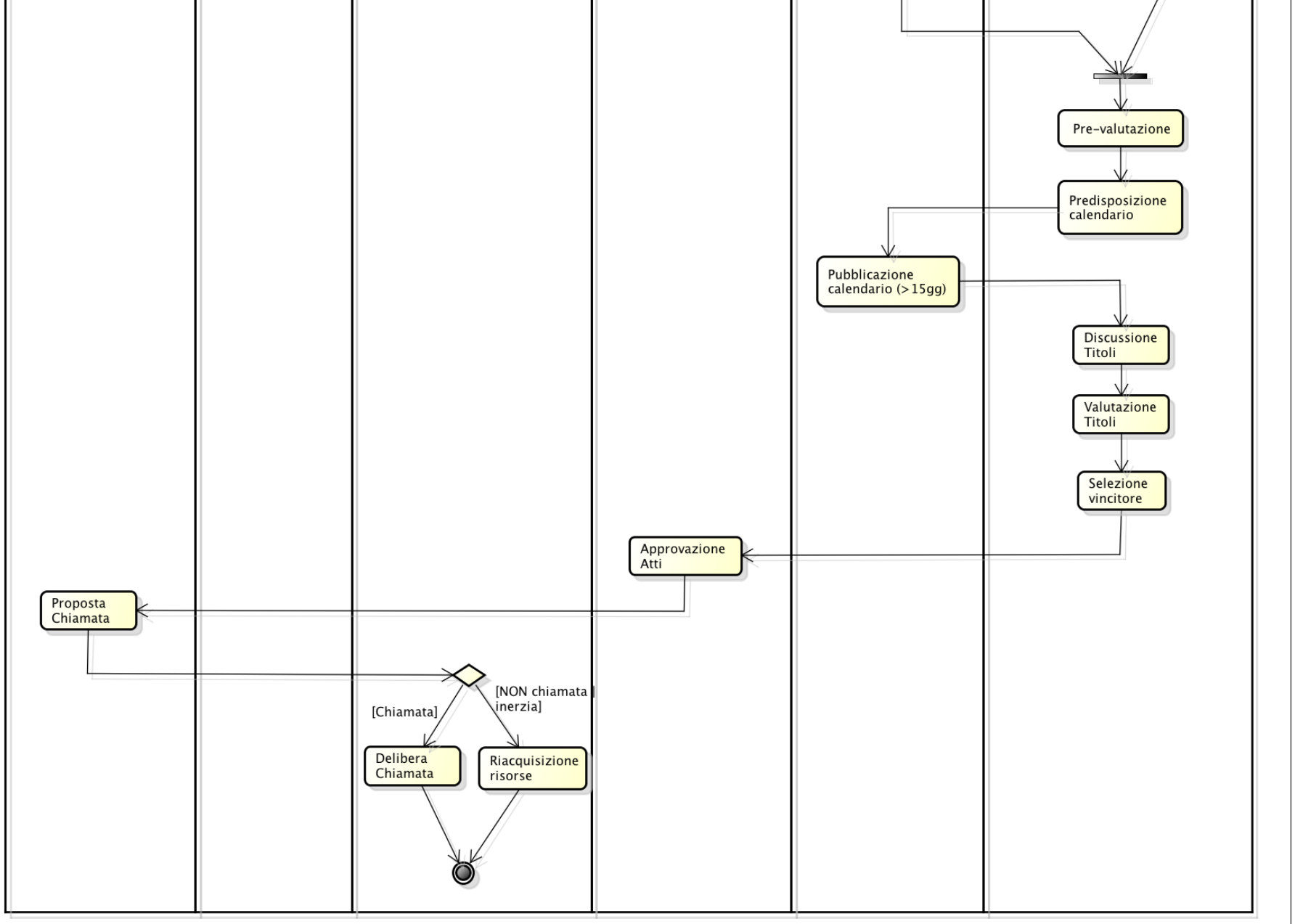
Organisational chart – micro



LRC – linear responsibility chart

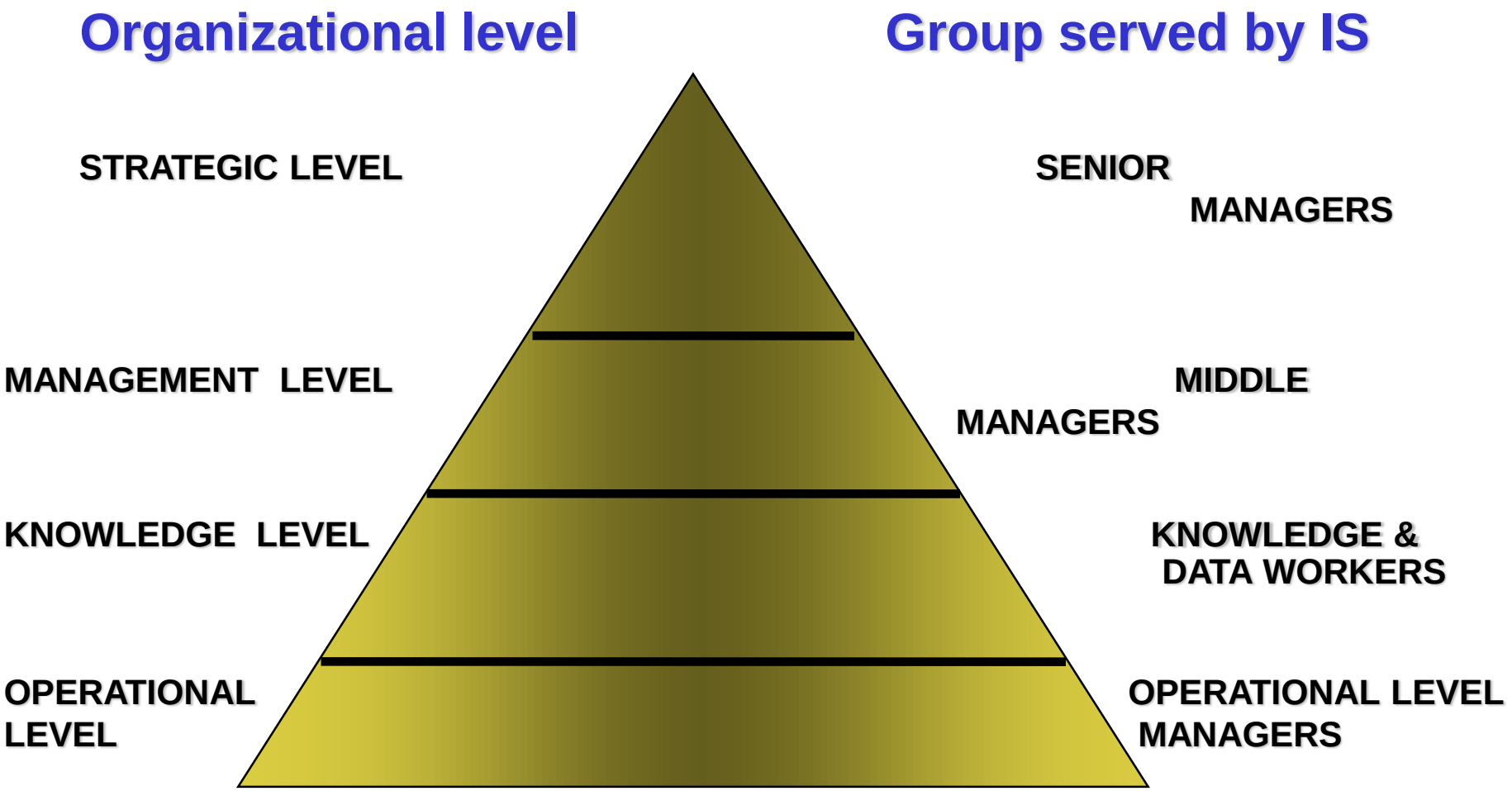
Processes (samples)	Organization's Structures							External Actors	
	Purchase	Design	Production	Sales	Admin.	Human Reources	Information Systems	Supplier	Customer
Management Report Production	C	C	C	C	P	C	C		
Customer Order Processing			P	P					C
Procurement	P		P					P	

P=Participant C=Client



TAXONOMIES OF IS

Organizational view



Example of process/levels

- City:
  - **Operational**– citizen payment accounting, road maintenance
  - **Management** – payment control, reminders, monthly comparison of budget vs. actual income, pollution monitoring
  - **Strategic** – check costs and incomes of social services, definition of new prices, building plans

Example of process/levels

- Bank:
  - **Operational** – management of accounts
  - **Management** – review of negative balances
  - **Strategic** – assess performance of a service, decision to activate a new service

Example of process/levels

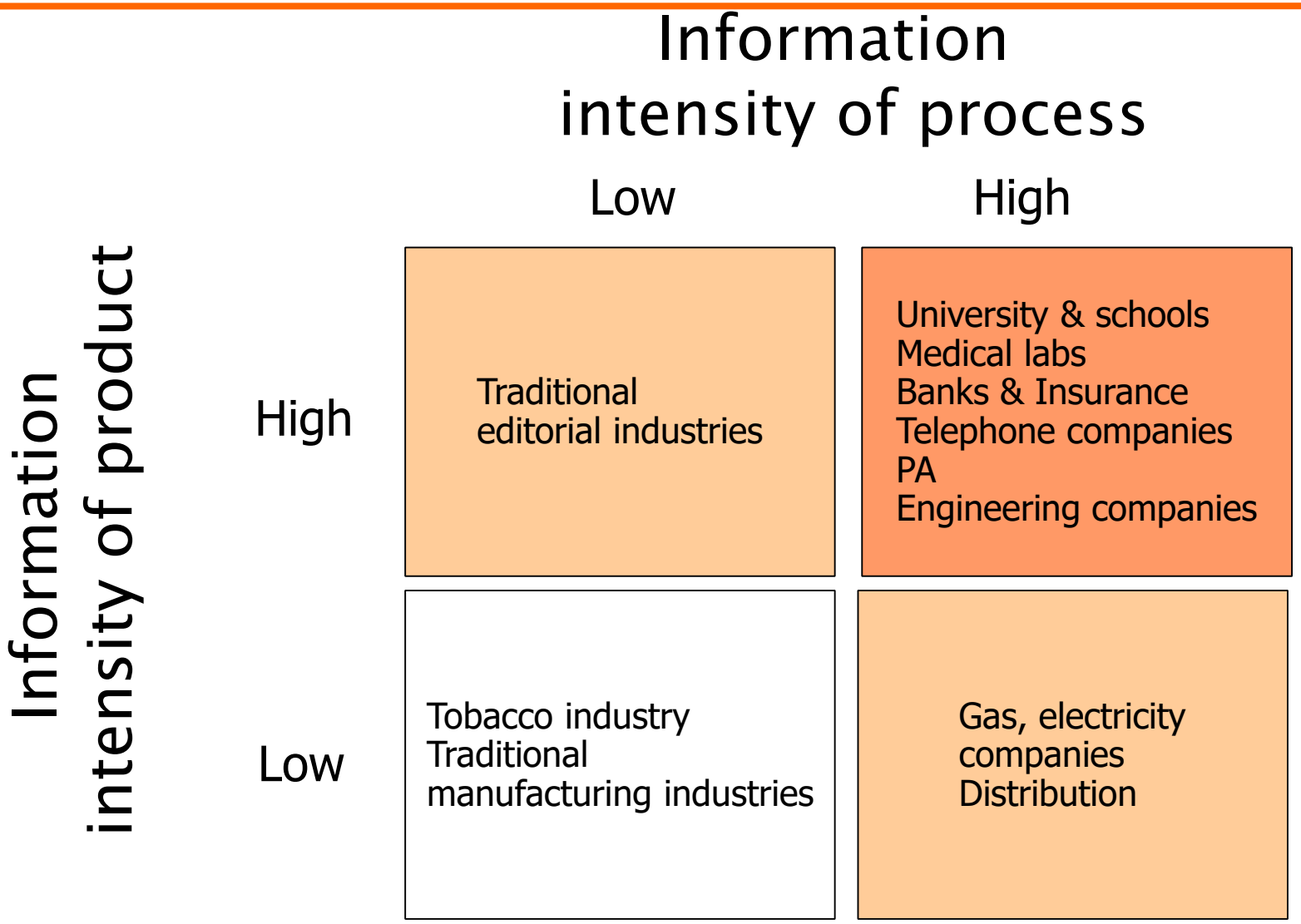
- Company:
  - **Operational** – recording of orders
  - **Management** – check weekly budget vs. actual
  - **Strategic** – select most promising market areas

Operational level

- Importance of IS = f (IO, IP)
  - IO – Information intensity of product
  - IP – Information intensity of process

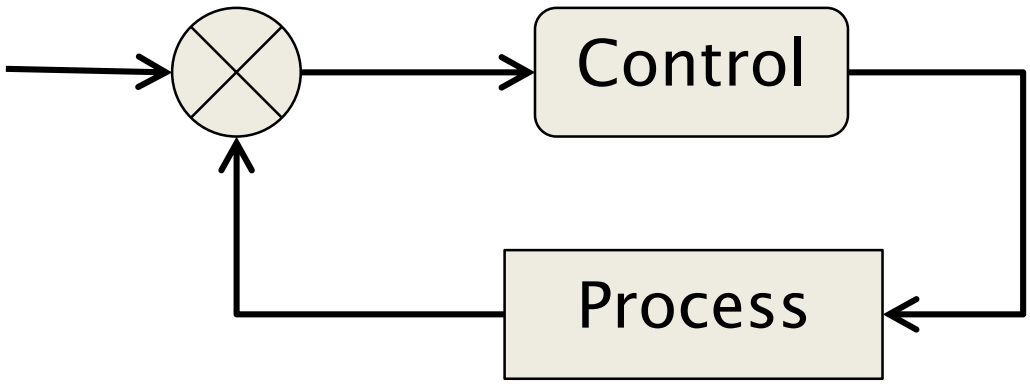
[Porter Millar 1985]

Operational level



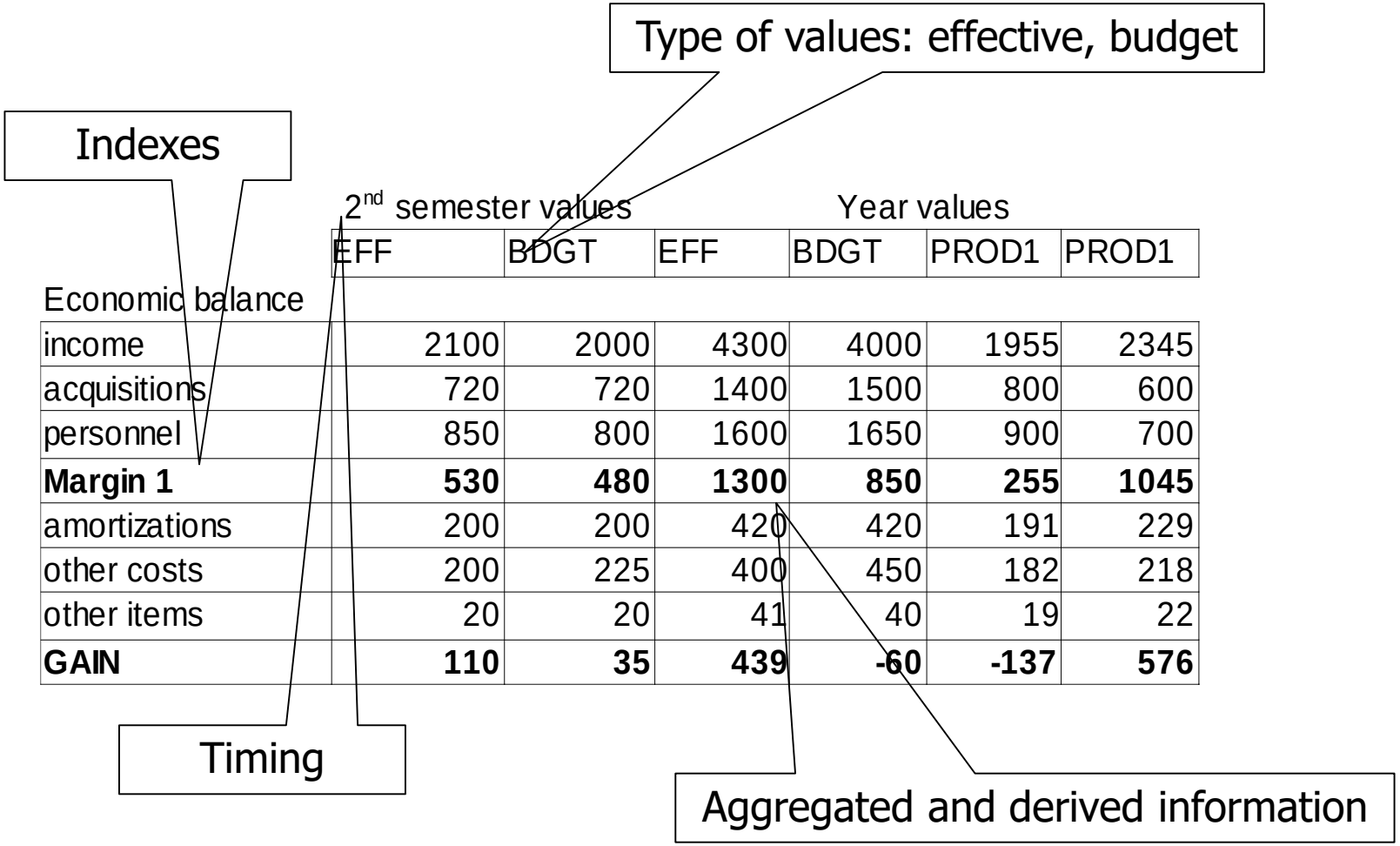
Management level

- Supports the control loop
  - Goal definition
    - typically economical / budget
  - Analisys of results
  - Corrective actions



Management level

Management IS: Information for control



Economic balance	2nd semester values EFF	2nd semester values BDGT	Year values EFF	Year values BDGT	Year values PROD1	Year values PROD1
income	2100	2000	4300	4000	1955	2345
acquisitions	720	720	1400	1500	800	600
personnel	850	800	1600	1650	900	700
Margin 1	**530**	**480**	**1300**	**850**	**255**	**1045**
amortizations	200	200	420	420	191	229
other costs	200	225	400	450	182	218
other items	20	20	41	40	19	22
GAIN	**110**	**35**	**439**	**-60**	**-137**	**576**

Operational vs. Management

	Operational	Management
Usage	Continuous	Periodic (eg. weekly)
Information	Simple, Current	Aggregate, Historical

Strategic

- Analysis of very large data sets
  - Customer analysis (profiling)
  - Product analysis (dependability)
  - Performance analysis (dashboard)
    - Response time, quality level
      - Cmp. Management level focused on costs

Strategic level

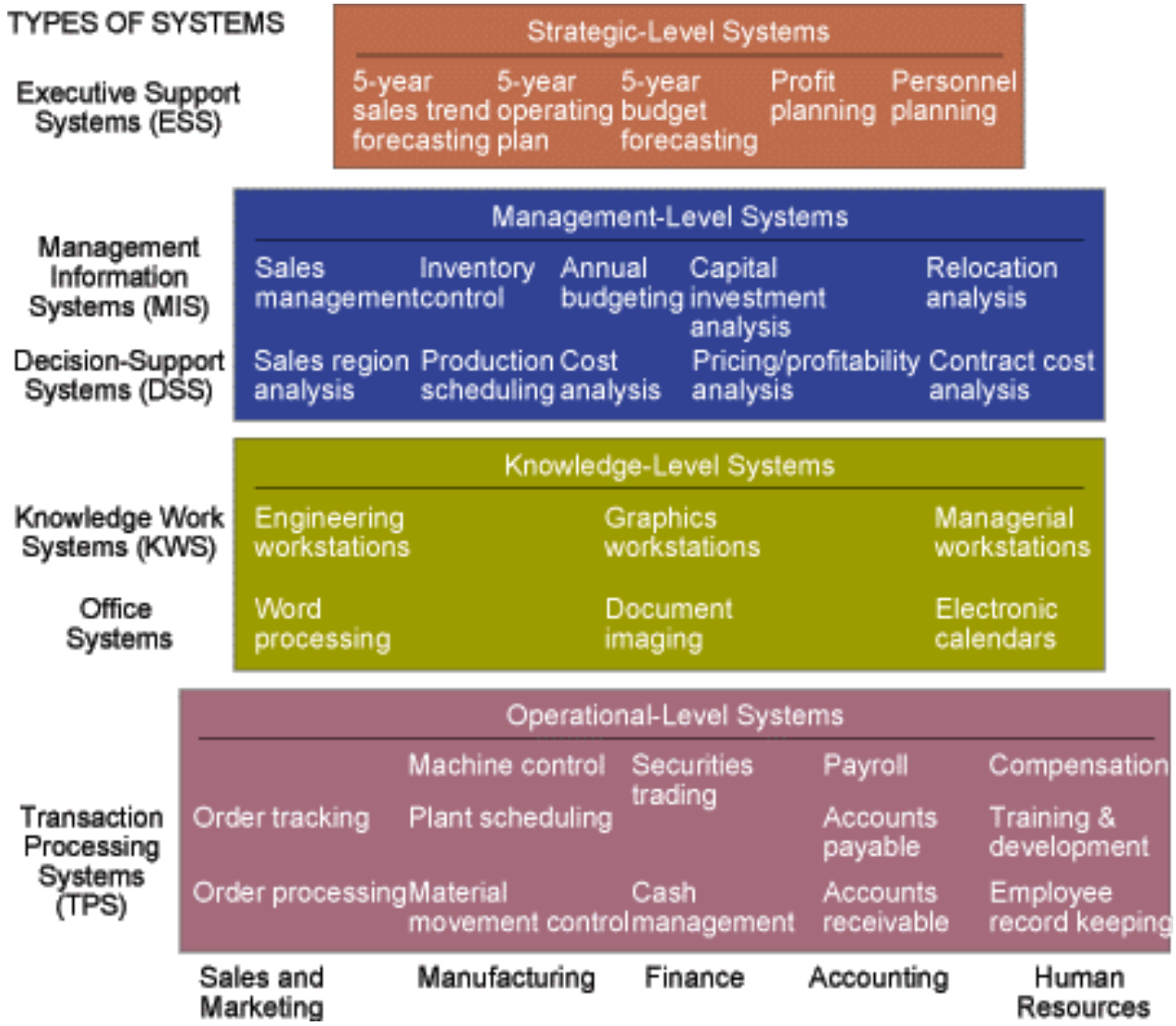
- Volumes of data available for analysis via business intelligence, data warehouse

Sector	Number of usual customers (order of magnitude)	Example of analysis (indexes)
Telephony (eg. EU monopolists)	More than 10 Milion	- Profitability
		- Behavior / preferences
Bank (large banks)	More than 1 Milion	- Profitability
		- Behavior / preferences
Electricity and gas (European monopoly)	Between 100.000 and 1 Milion	- Profitability
		- Behavior / preferences
PA / Finance (Europe)	More than 10 Milion	- Sectorial study
		- Segmentation of customer
		- Identify potential
Distribution	Between 100.000 and 1 Milion	- Behavior / preferences

Major types of systems

- Executive support systems (ESS)
- Management information systems (MIS)
- Decision support systems (DSS)
- Knowledge work systems (KWS)
- Office automation systems (OAS)
- Transaction processing systems (TPS)

Major types of systems

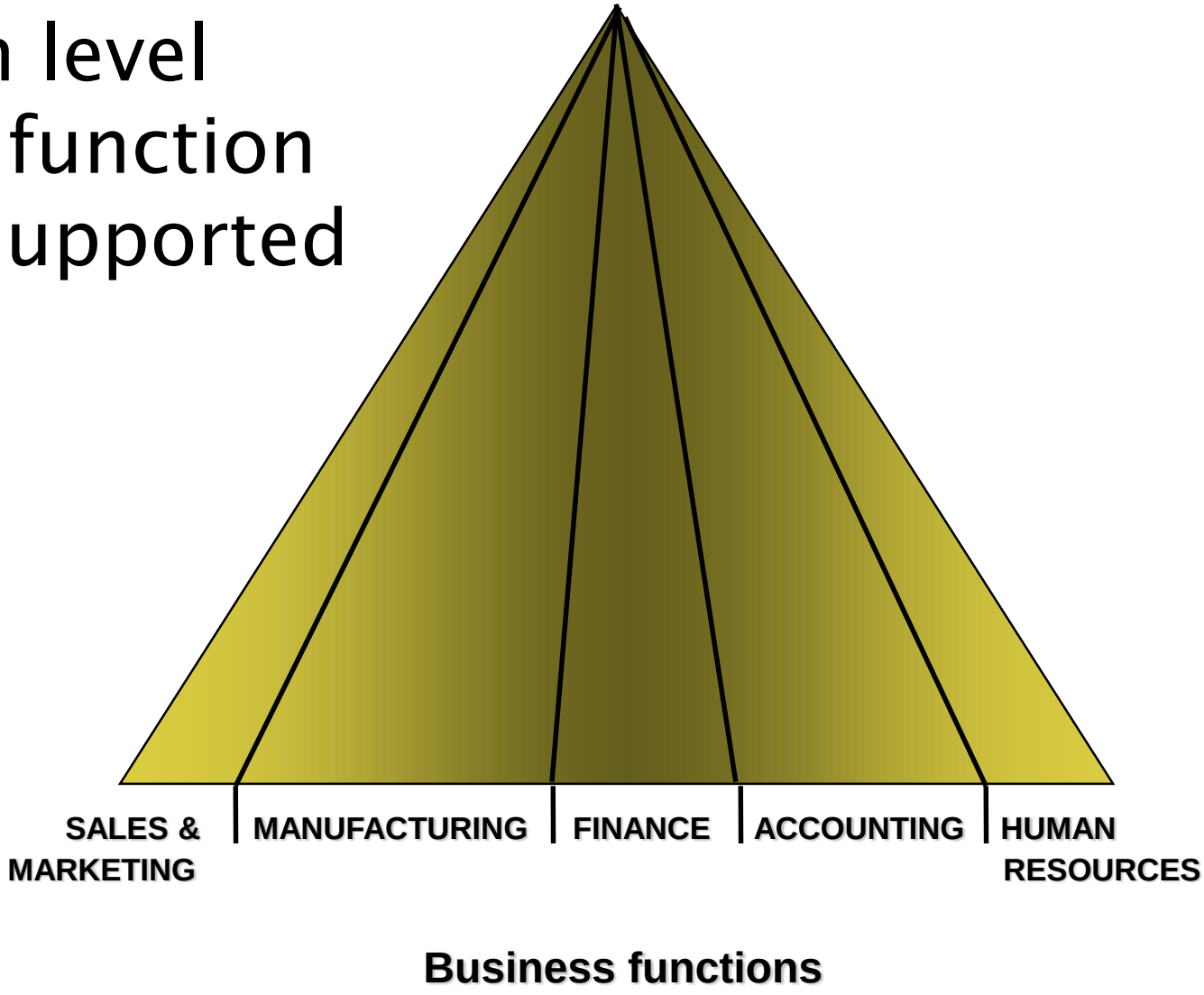


Characteristics of IS

System	Input	Processing	Output	User
ESS	Aggregate data (external, internal)	simulation	Projections	Senior managers
DSS	Low-volume data (from optimized DBs), analytic models	Simulation, analysis	Special reports, decision analysis	Professionals, staff managers
MIS	Transactions summaries, high-volume data	Routine reports, low-level analysis	Summary and exception reports	Middle managers
KWS	Design spec, knowledge base	Modeling, simulation	Models, graphics	Professionals, technical staff
OAS	Documents, schedules	Document management, scheduling, communication	Documents, schedules, mail	Data workers
TPS	Transactions, events	Sorting, listing, merging	Detailed reports, lists, summaries	Operational managers, supervisors

Business function view

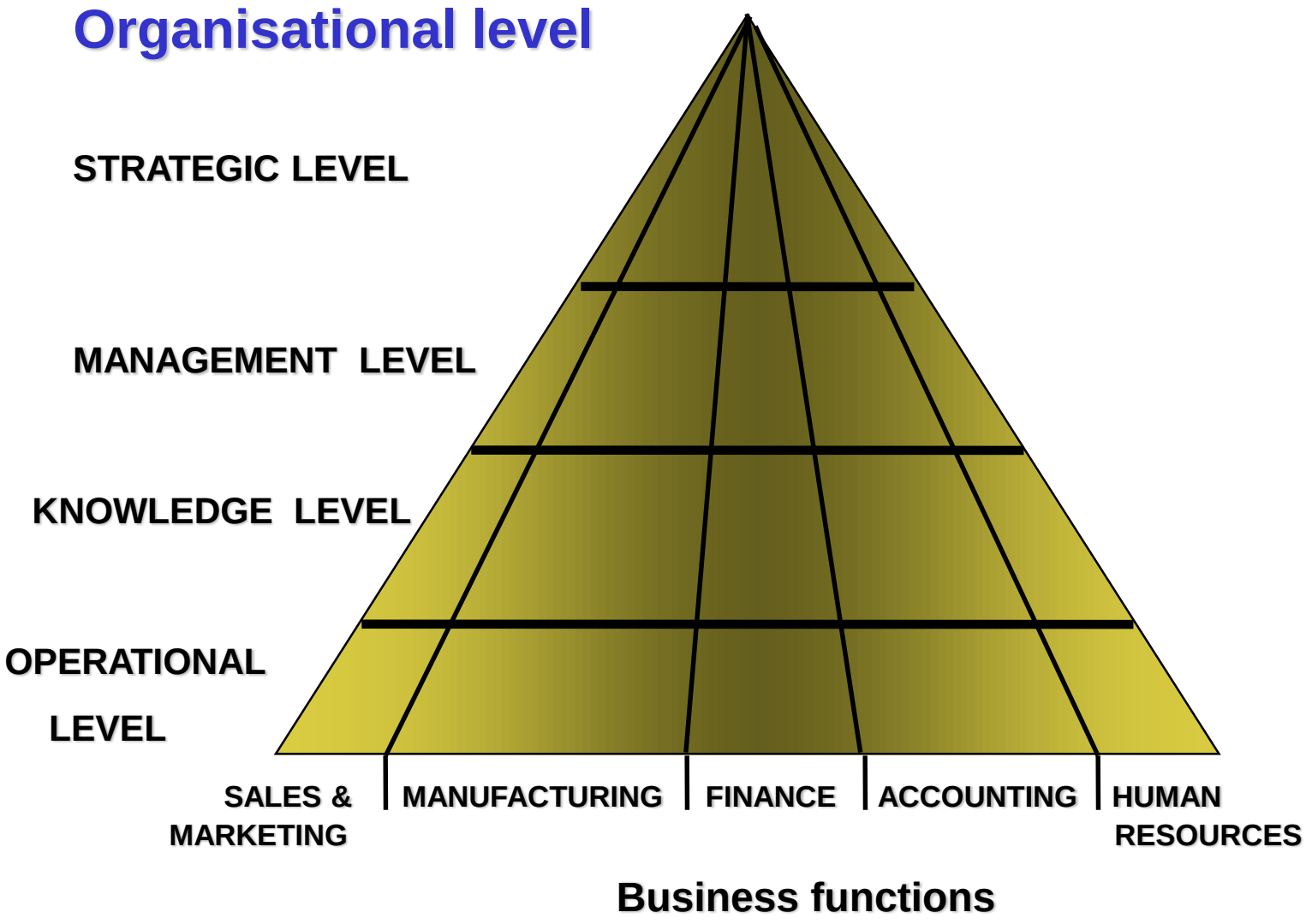
- IS as high level business function offered/supported



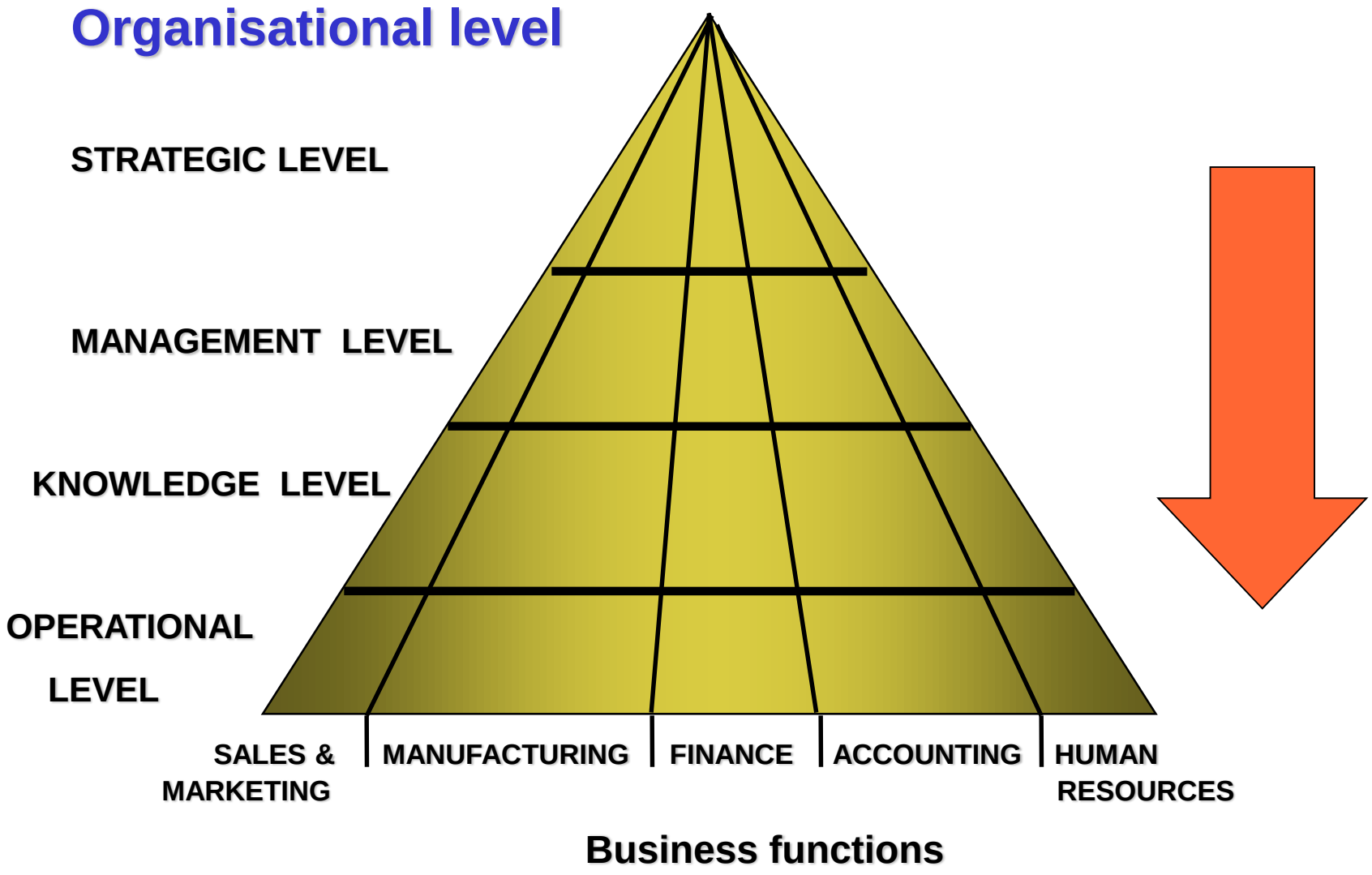
Services to business functions

- E.g. Manifacturing function
  - Fulfill an order
  - Look at status of order
- E.g. Sale function
  - Accept an order
  - Make a bid

Anthony's pyramid



Functional taxonomy



Functional taxonomy

- Sales and Marketing
- Manufacturing and Production
- Finance and Accounting
- Human Resources

Sales and Marketing

- Marketing is concerned with
  - identifying the customers
  - determining what they need or want
  - planning and developing products and services to meet their needs
  - advertising and promoting these products and services
- Sales is concerned with
  - contacting customers
  - selling the products and services
  - taking orders
  - following up on sales

Sales & Marketing examples

System	Description	Level
Order processing	Enter, process and track orders	Operational
Market analysis	Identify customers using demographics, markets, trends	Knowledge
Pricing analysis	Determine price for product or service	Management
Sales trend forcasting	Prepare 5-year sales forcast	Strategic

Manufacturing and Production

- Activities deal with
  - Planning, development, and maintenance of production facilities
  - The establishment of production goals
  - The acquisition, storage, and availability of production materials
  - Scheduling of equipment, facilities, materials, and labor required for finished products
- Integrate and control the production flow

M&P examples

System	Description	Level
Machine control	Control action of machines	Operational
Computer-aided design	Design new product	Knowledge
Production planning	Decide when and how many	Management
Facilities location	Decide where to locate new facilities	Strategic

Finance and Accounting

- Finance function
  - Managing the financial assets, such as cash, stocks, bonds, and other investments, in order to maximize the return
- Accounting function
  - Maintaining and managing the firm's financial records/receipts, disbursements, payroll, to account for the flow of funds in a firm

Finance and Accounting

System	Description	Level
Account receivable	Track money	Operational
Portfolio analysis	Design portfolio of investments	Knowledge
Budgeting	Prepare short-term budgets	Management
Profit planning	Plan long-term profits	Strategic

Human Resources

- HR function is responsible for
  - Attracting workforce
  - Developing workforce
  - Maintaining workforce
- Human resources information systems support activities such as
  - Identifying potential employees
  - Maintaining complete records on employees
  - Creating programs to develop employees skills

Human Resources

System	Description	Level
Training and development	Track employees training, skills and extimate performance	Operational
Career pathing	Design career paths for employees	Knowledge
Compensation analysis	Monitor fairness in employees wages and benefits	Management
HR planning	Plan long-term labor needs	Strategic

IS APPLICATIONS

Application Portfolio

- Typically an IS is composed of several applications (programs) and often multiple data bases
- Application Portfolio =
  - List of all the applications in an organization
  - In a medium-large organization after years of evolution it is quite difficult to make a census of present application with their goals
  - AP knowledge is fundamental for
    - Evaluate the organization's IS
    - Define acquisitions/changes of applications

AP and evolution

- Typical scenario: a company acquired / installed different applications at different times
  - From distinct vendors,
  - Running on distinct hw/sw platforms
  - Using different DBs
- The results are
  - Problems of information integration
  - High maintenance costs

Master and transactional data

- Applications of the IS work on
  - Master data (static list, class diagram in UML or ER model)
    - E.g. customers, suppliers, products ..
    - Change but seldom
  - Transactions (events, use case diagram or activity diagram in UML)
    - New order, order completed, received material, sent material

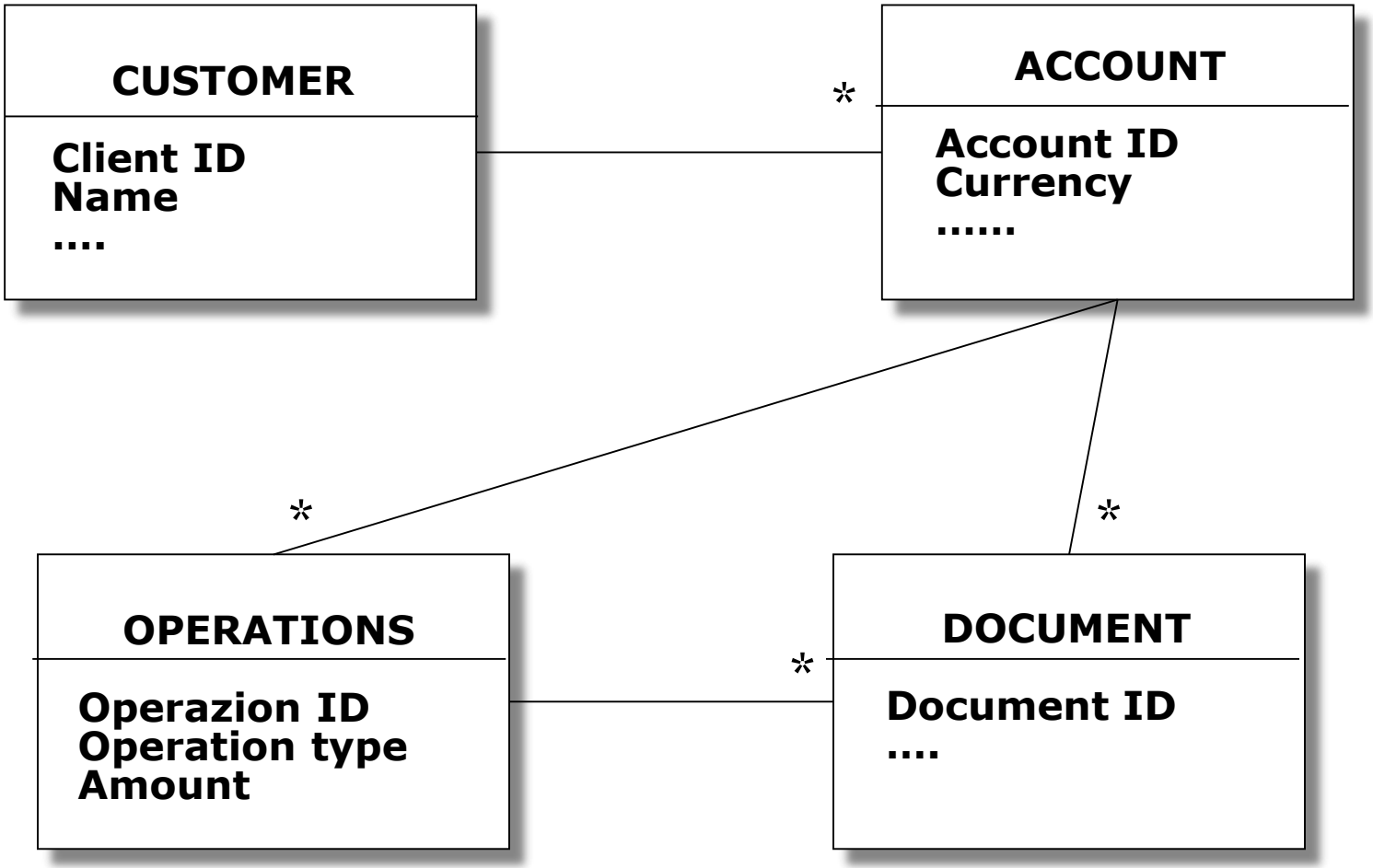
Master data vs. Transactions

Macro-process	Transactions a Master data
Design and engineering	Update of product and production process master data
Incoming Logistics and raw materials supply	Order for materials to supplier
Production	Work order
Outgoing logistics and sales	Customer order (different channels)
Personnel	Presence and absence
Administration and infrastructure	Scrap book

Transactions and master data

- Technological perspective
  - Master data is implemented with one (or more) tables in a DB
    - E.g. customers table
  - A transactions record requires
    - Searching for the involved entity (master data)
    - Read from master data
    - Write information concerning transaction in one or more DB tables

Example bank accounts



Why learning IS?

- Most organization need information system to survive and prosper
- Information system knowledge is essential for managers
  - IS directly affect how managers decide, plan, and manage their employees
  - Responsibility for systems cannot be delegated to technical decision makers

Why learning IS?

- Most organization need information system to survive and prosper
- Information system knowledge is essential for IS designers
  - Understand system requirements of global business environment
  - Create information architecture that supports organization's goals
  - Design competitive & efficient systems