

Master Degree Programme in Computer Science

Enterprise Information Systems

4. Operational Support



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Application portfolio

- Directional portfolio
 - strategic planning
 - planning and control of resources
 - management control
- Institutional portfolio
 - support processes (Admin., Accounting, HR)
- Operating portfolio
 - primary processes



The role of operational support systems

Exchange of information on / between business processes

1965 booking flights (American Airlines)

1968: Order Management (IBM)

80: MRP - Manufacturing Resource Planning

90: ERP - Enterprise Resource Planning

then ...: Internet (B2B, B2C)

Types of information

- anagraphical data
 - collections: objects, actors, etc.
 - nature: description, status (diagr. of states)
- transactional data
 - exchange of goods, services, information
 - trade / contracts / orders, processing, handling, certification / verification
- planning data



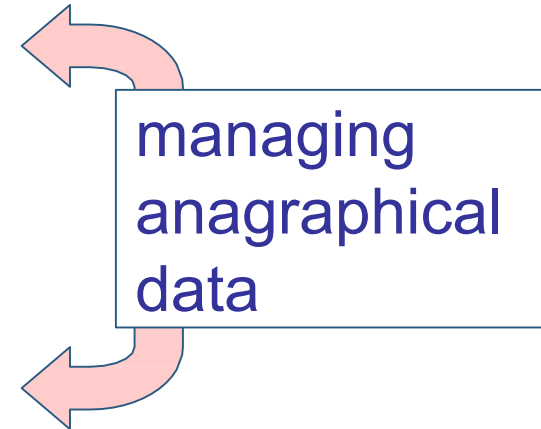
Processes / transactions

Macro-process	Class of transaction
Design and industrialization	<ul style="list-style-type: none"> • Updating of registers of products and production processes • Transactions related to laboratories • Transactions related to contracts for design and testing
Inbound logistics and procurement of raw materials	<ul style="list-style-type: none"> • Orders to suppliers of direct material • Orders to suppliers of auxiliary and indirect materials • Movements of direct materials • Movements of the auxiliary and indirect materials
Production	<ul style="list-style-type: none"> • Work Orders • Transformations • Movements of semi-finished products
Outbound logistics, marketing and sales	<ul style="list-style-type: none"> • Customer orders via web, telephone, mail, shop, agent • Physical movements of finished products • Invoices to customers, payment, refunds
Personnel Management	<ul style="list-style-type: none"> • Attendance and absences • Salaries • Development Management
Administration and infrastructure activities	<ul style="list-style-type: none"> • First note accounting • Customer and supplier accounts, banks



Processing Transactions

- direct functions
 - add / edit transactions
- administration functions
 - user profiles
 - managing backup / restore
 - security
 - reversal in DW



Typical activities in the processing of transactions

in direct functions:

- Transaction logging
- Status Update (in master data)
- Transaction Log (web: clickstream logs) in administration activities
- rollback

Master data and transactional data

Process	Master data ("dati anagrafici")	Transactional data ("dati transazionali")	
		<u>state</u>	<u>event</u>
Airline reservations	<ul style="list-style-type: none"> • schedule 	<ul style="list-style-type: none"> • available places 	<ul style="list-style-type: none"> • reservations
Parts	<ul style="list-style-type: none"> • catalogue 	<ul style="list-style-type: none"> • available stocks 	<ul style="list-style-type: none"> • inputs outputs • requested withdrawal • removal orders
Production	<ul style="list-style-type: none"> • products • installations • raw material 	<ul style="list-style-type: none"> • available capacity • stocks raw materials • <i>work in progress (WIP)</i> 	<ul style="list-style-type: none"> • payment • waste • withdrawals stock • internal movements
Account management	<ul style="list-style-type: none"> • customers • bank accounts 	<ul style="list-style-type: none"> • account balance 	<ul style="list-style-type: none"> • bank transactions
Mail order	<ul style="list-style-type: none"> • products • price list 	<ul style="list-style-type: none"> • stock 	<ul style="list-style-type: none"> • orders

Systems for Planning and Control of Operations

Objectives:

- set goals
- provide work instructions
- synchronize actions
- record transactions

PLANNING

MONITORING PROGRESS

data acquisition from transactional system that records the progress of the work



Amazon.com

- consulting catalogs
- new customer account
- orders
- Loop
 - basic services to the customer
 - continuous service improvement

Google.com

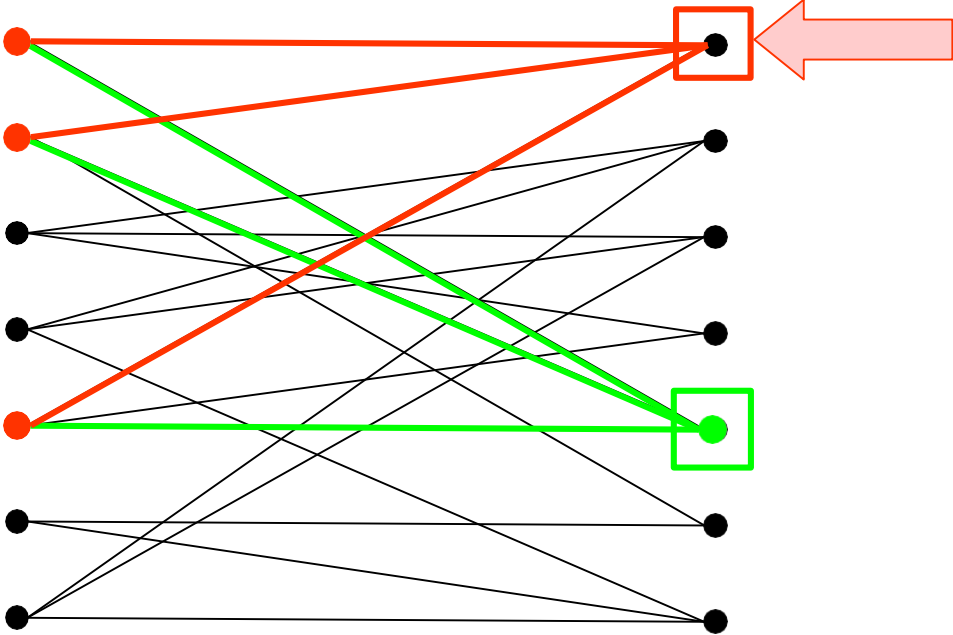
- acquisition of huge volumes of information
- generic searches
- Loop
 - basic services to the customer
 - increase in volume of user
 - sale of advertising space
 - service improvement

Cooperative Filtering

Bipartite Graph

CUSTOMERS

PRODUCTS



Application Portfolio

Directional Portfolio

strategic planning and control

directional planning and control (budget, reporting, ...)

Institutional portfolio

administration

management of HR

other support processes

Operational Portfolio (manufacturing)

manufacture

sales and distribution

design

after-sales

other primary processes

Institutional portfolio

Support processes:

- compliance with the law
- accounting, administration, security, ...
- administration infrastructure
- property
- inputs
- personnel, supplies, equipment, ...



Institutional Portfolio: features

- horizontal market (as opposed to enterprise)
- large volumes
- repetition
- islands of efficiency
- Cost reduction: economies of scale
- Data Processing: economies of scope
⇒ better planning and control



Example: Administration and Finance

- Administration

- General Ledger

- journal
- budget

- Passive bills

- check up
- imputation

- Active invoices

- issue
- imputation

- Credit Score

- reminder
- built

- Finance

- Finance

- permission
- liquidation

- Banks

- corporate coffers
- treasury
- relationships with banks

- Funding

- financial items
- cash

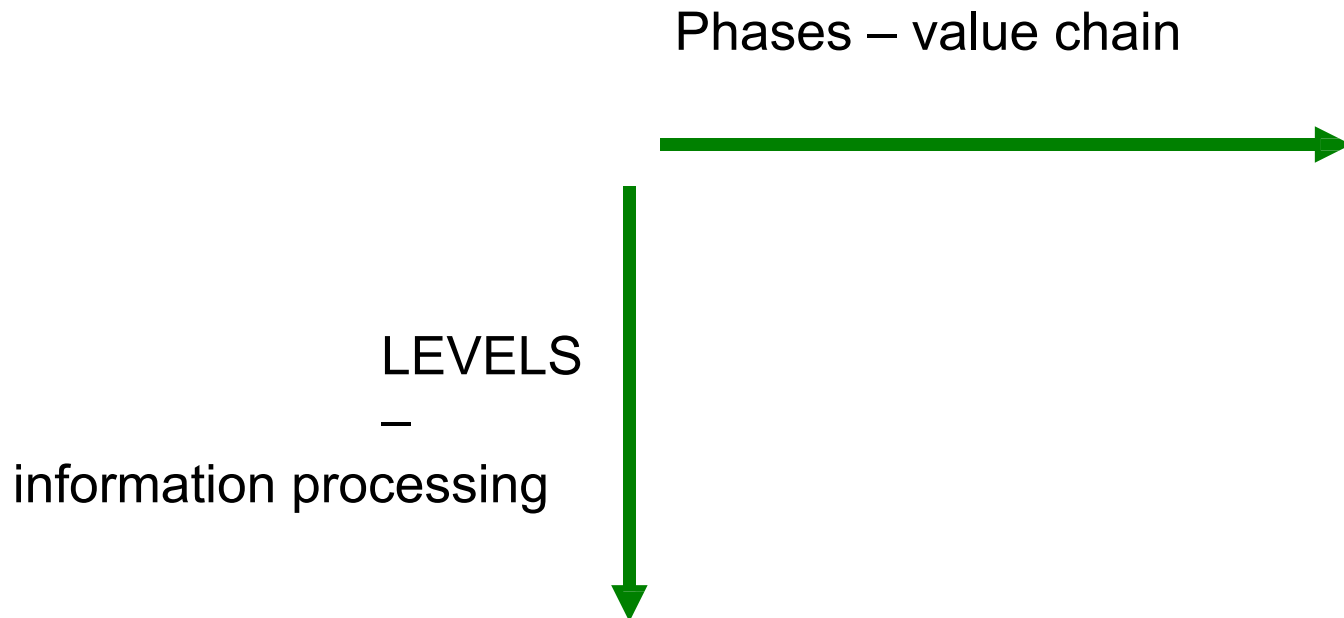
Operating Portfolio - Manufacturing firms

- applications used by the primary processes in the value chain
- vertical markets - specific of the industrial sector (manufacturing, banking, insurance, utilities, PA, ...)
- in some areas, the technology creates or modifies substantially the operational processes (eg .: TLC)



Operating Portfolio - Manufacturing firms

- areas defined by a grid
- opportunities for integration in the two coordinates



Characterization of phases and levels

Phases: →

- design and industrialization
- provision
- manufacture
- distribution and sale

Levels: ↓

- decision, planning, control
- execution
- technical data management

LEVELS

PHASES



	design and industrialization	procurement	manufacturing	distribution and sale
strategic and environmental analysis	<ul style="list-style-type: none"> technology observatory 	<ul style="list-style-type: none"> purchases 	<ul style="list-style-type: none"> (irrelevant) 	<ul style="list-style-type: none"> marketing
planning	<ul style="list-style-type: none"> projects plan 	<ul style="list-style-type: none"> purchase plan 	<ul style="list-style-type: none"> production plan 	<ul style="list-style-type: none"> sales forecast
technical data management	<ul style="list-style-type: none"> drawings archive bill of design 	<ul style="list-style-type: none"> suppliers master data bill of materials 	<ul style="list-style-type: none"> department master data production cycles 	<ul style="list-style-type: none"> customer master data product master data
operating planning	<ul style="list-style-type: none"> project planning 	<ul style="list-style-type: none"> supply planning 	<ul style="list-style-type: none"> factory planning 	<ul style="list-style-type: none"> transport and delivery planning
scheduling	<ul style="list-style-type: none"> scheduling of projects and departments 	<ul style="list-style-type: none"> scheduling of deliveries and reminders 	<ul style="list-style-type: none"> department scheduling 	<ul style="list-style-type: none"> transport scheduling
order flow	<ul style="list-style-type: none"> worksheets 	<ul style="list-style-type: none"> supplier order management 	<ul style="list-style-type: none"> production order management 	<ul style="list-style-type: none"> customer order management
material flow & operations	<ul style="list-style-type: none"> department management 	<ul style="list-style-type: none"> receiving and testing laboratories raw materials stock stock handling production fees 	<ul style="list-style-type: none"> stock management production control 	<ul style="list-style-type: none"> shipping & transportation finished products warehouse
				<ul style="list-style-type: none"> order tracking



A. Decision, planning, control

- Strategic Analysis
 - DSS reports
- annual planning
 - simple applications
- operational planning
 - system complexity, diversity data
 - exploitation of human and material resources
 - feedback, reprogramming
- scheduling
 - algorithmic structure of the specific device



B. Execution

Basic scheme:

- orders
- stocks
- physical operations

Transaction processing systems

Control systems for production



C. Technical Data Management

- collection of personal data
- possibility of using a data warehouse

Structure and typical applications

- Bill of materials (BOM) \Rightarrow tree
- design plan \Rightarrow constraints
- processing plan

IT: configurability of production (via web)

E.g.: cars, computers, ...

Datawarehouse in the operating environment

- high performance required
- high volume of data
- relatively static data
 - prevailing question
 - nonessential instant update
 - alignment techniques



Typical solutions

- CIM : Computer Integrated Manufacturing
- MRP : Manufacturing Resource Planning
- ERP : Enterprise Resource Planning
- CRM : Customer Relationship Management
- e-procurement (buy-side)

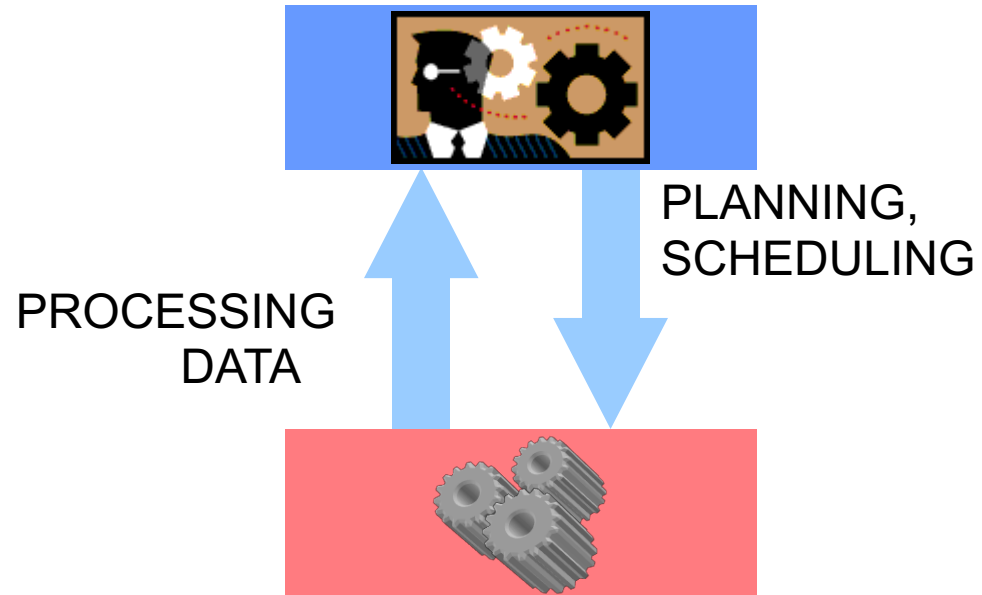
CIM : Computer Integrated Manufacturing

- reference architecture
- integration:
 - planning system
 - operating system support
- integration:
 - production processes (information processing)
 - information processing (data management)
 - technologies at various levels



Processing Levels in a CIM architecture

- company
- plant
- area
- cell
- machine



- flow of information and control between levels
- processing within each level
- automation opportunities

CIM – placement

Directional Portfolio

strategic planning and control

directional control

directional planning

Institutional portfolio
(support processes)

administration

management of HR

other support processes

Operational Portfolio
(primary processes)

design

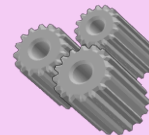
provisioning

manufacturing

distribution and sales

after-sales

CIM



MRP : Manufacturing Resource Planning

- result of explosion of BOM and related requirements
- balancing of production processes and processing issues
- **SUPPORTED** mainly:
 - production
 - provision
- **MARGINAL SUPPORT:**
 - sales
 - administration



MRP – placement

Directional Portfolio

strategic planning and control

directional control

directional planning

Institutional portfolio
(support processes)

administration

management of HR

other support processes

MRP

design

provisioning

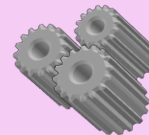
manufacturing

distribution and sales

after-sales

Operational Portfolio
(primary processes)

CIM



CRM



ERP: Enterprise Resource Planning

- MRP ideas are extended to
 - administrative and financial
 - sales - after sales
 - management activities
- basic components
- shared DB \Rightarrow sharing information
- dramatic reduction of costs and I / O errors
- associated transactions and documents
- processes description is defined and managed



MRP – placement

Directional Portfolio

strategic planning and control

directional control

directional planning

ERP

Institutional portfolio
(support processes)

administration

management of HR

other support processes

MRP

design

provisioning

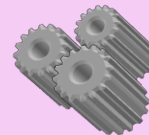
manufacturing

distribution and sales

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Operational Portfolio
(primary processes)

CIM



CRM



- Products: SAP, Oracle, Peoplesoft, JD Edwards, Baan, ...
- typical products are modular
- model:
 - processes
 - organizational structure
 - database
- installation \Rightarrow parametrization
- ERP project \Rightarrow BPR (!)

ERP or not ERP?

- benefits
 - costs
 - business process performance
- contraindications
 - operating rigidity
- limits
 - not a strategic solution
 - limited CRM functionality

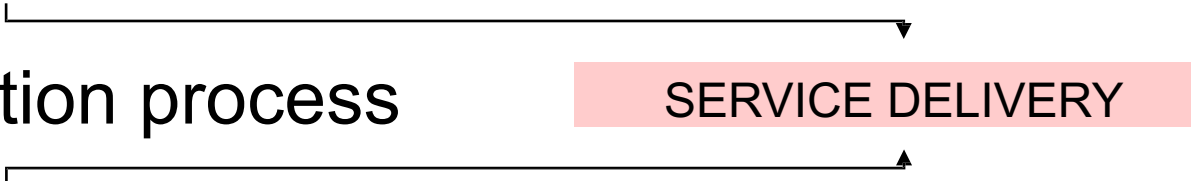


Most popular ERP: SAP

- Company: 1972; product launch (R / 2): 1979
- runs on multiple platforms HW / SW
- multitier architecture:
- DB server
 - DB server
 - application server
 - presentation server

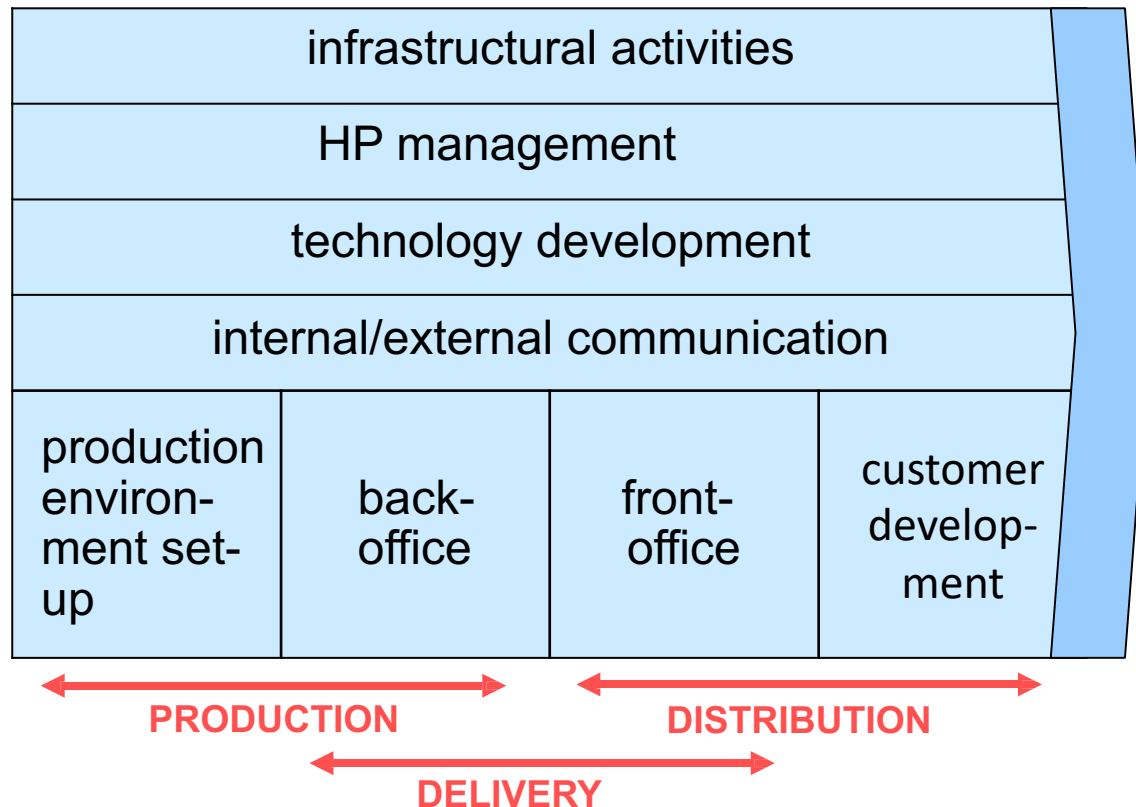


Operating Portfolio - service company

- services: information-intensive activities
 - fusion of design and production service
 - with reference to the value chain:
 - production process
 - predisposition production conditions
 - **back-office** (delivery in the absence of the client)
 - distribution process
 - **front-office** (delivery with the customer)
 - catching customers
- 
- ```
graph LR; BO[back-office] --> FO[front-office]; SD[SERVICE DELIVERY];
```

# Value chain for a service company

- eg.: credit, insurance, financial services



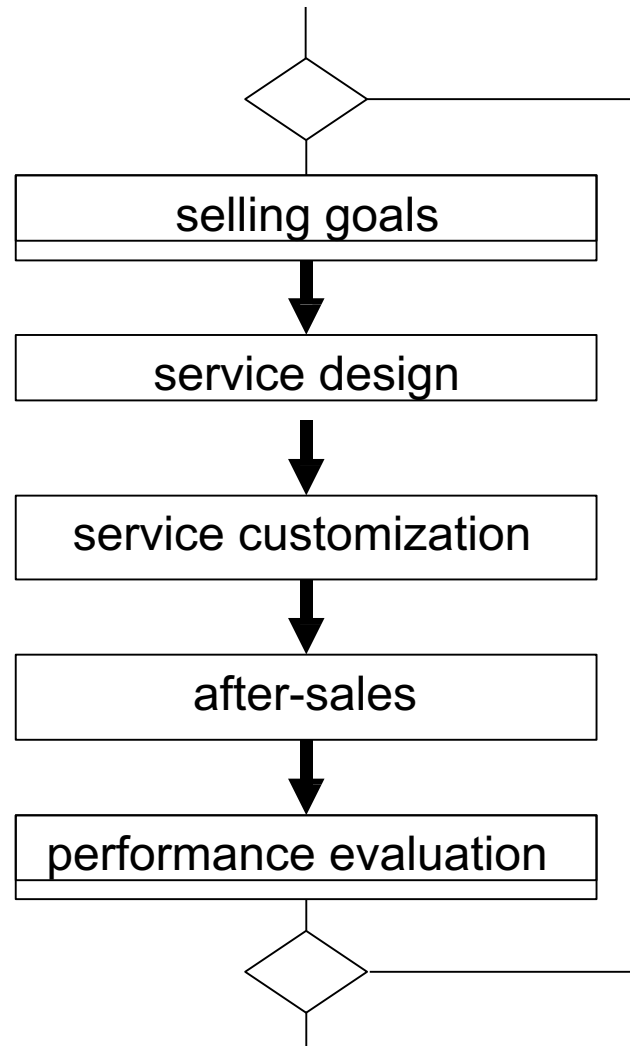
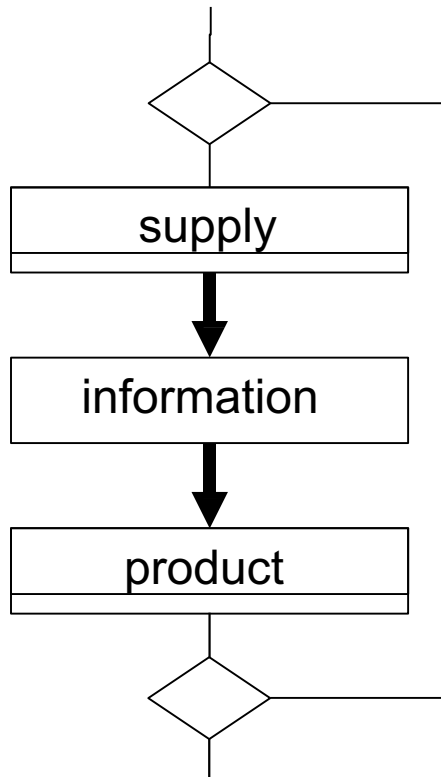
# Information management supported by ICT

- order flow
  - incoming orders
  - customized service
  - production and service delivery
  - after sales
- knowledge management
  - processing information gained during the delivery and service production
  - transformation into usable knowledge



# Virtuous circles

associated with *knowledge management*  
in a service enterprise



# Knowledge worker

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- work of a decisional nature
- development of essential skills
  - in process execution
  - in (re) design of processes
- typical in services companies with a high degree of customization or negotiation with the customer





# Services with high degree of customization

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- ICT support to mutual consultancy within an organization
  - ⇒ knowledge management
- specialized service
  - ⇒ generality of the knowledge