Information systems types

The Information System

Socio-Technical Systems
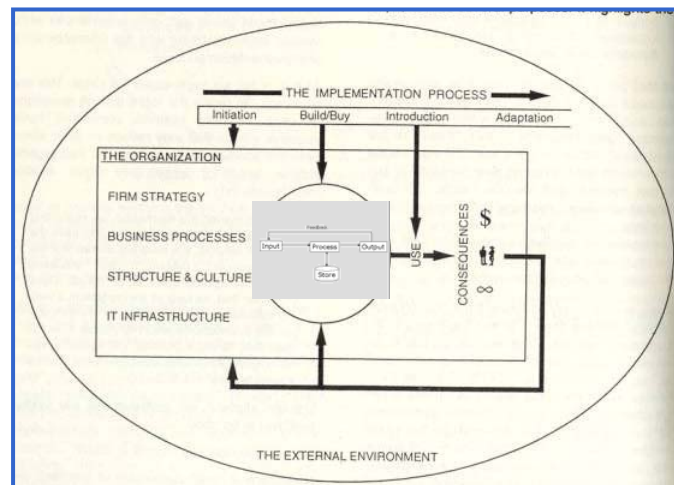
| Social System | Technical System |
| Structure →← Technology → Enabler |
| People ←→ Process |
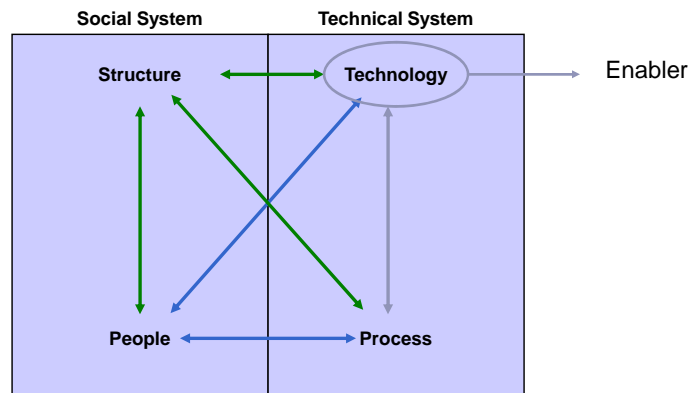
The CIO's take

Many companies rush out, buy software solutions, install them quickly, and then can't understand why the system failed. We look at what <u>business issues</u> exist, what <u>people</u> and <u>processes</u> pertain to that business issue, what those people do. <u>Technology</u> won't solve by itself – other components have to be part of the solution.

Mark Hedley, *CIO, Wyndham International*

Definitions

Data and Information

85903380 1 Aug 29 2001 Aug 30 2001 99.00 DR GABRIELE PICCOLI

Conf.#	Type	Arrival	Departure	Rate	Guest name
85903380	1	Aug 29 2001	Aug 30 2001	99.00	DR GABRIELE PICCOLI

ST3311 Peet's Guatemala 11.95

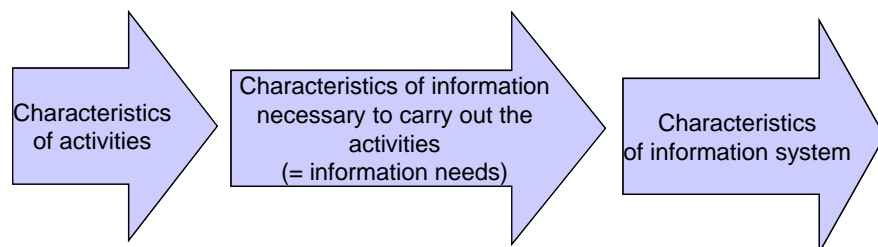| Product #	Manufacturer	Product Description	Price per lb.
ST3311	Peet's	Guatemala	11.95

Definitions

- Knowledge
- Process
- Infrastructure
- Architecture
- Inter-organizational system
- Intra-organizational system

Categorizing systems

- Audience:
  - Operations (TPS)
  - Tactical decision making
  - Executive level systems
- Organizational function (e.g., marketing; accounting, operations)
- Processing:
  - Batch vs. On-line vs. In-line
  - Centralized vs. Decentralized
- Scope:
  - *Intra*-organizational (e.g., property; corporate)
  - *Inter*-organizational

A possible information needs description: Anthony's pyramid

- The principle: an organization can be represented as a group of activities which can be divided into three sublevels
  - Strategic
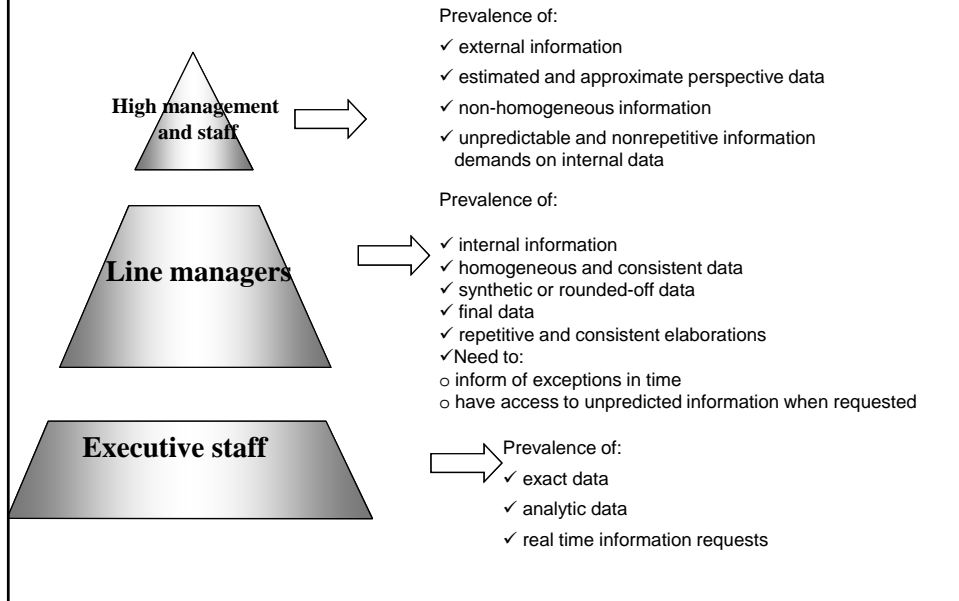 - Tactical
  - Operational
- How to use Anthony's pyramid

Characteristics of activities → Characteristics of information necessary to carry out the activities (= information needs) → Characteristics of information system

Anthony's Pyramid: a classification of business activities

Strategic Planning	**Strategic activities**	Choice of business goals Choice of resources for their achievement Definition of business policies
Planning and Control	**Tactical activities**	Planning of available resources for an effective use Verification of the achievement of planned goals
Operational Activities	**Operational activities**	Routine management of business activities

---

Anthony's Pyramid: characteristics of activities

- time frame
- tendency towards the outside
- discretionary attitude
- repetitiveness
- predictability
- involved players

Information requirements

High management and staff →

Prevalence of:
- ✓ external information
- ✓ estimated and approximate perspective data
- ✓ non-homogeneous information
- ✓ unpredictable and nonrepetitive information demands on internal data

Line managers →

Prevalence of:
- ✓ internal information
- ✓ homogeneous and consistent data
- ✓ synthetic or rounded-off data
- ✓ final data
- ✓ repetitive and consistent elaborations
- ✓ Need to:
- o inform of exceptions in time
- o have access to unpredicted information when requested

Executive staff →

Prevalence of:
- ✓ exact data
- ✓ analytic data
- ✓ real time information requests

Characteristics of business activities

Business activities	Time horizon	Basic characteristics	Involved players
Strategic	Long term	Tendency towards the outside Almost no regularity and structurability	High management and staff
Tactical	Middle term	Repetitiveness Completeness Systematic approach	Line managers
Operational	Short term	Low discretionary power Easily definable procedures	Executive staff

Functions of an IS

- Information gathering

- Information storage and maintenance

- Information processing

- Information distribution and exchange

Information managed by Information Systems

- concerns the way the organization works (i.e. customers, products, invoices)
- forms an information network at various hierarchical levels for various organizational units
- represents the basis to carry out operations and make decisions

Examples of decision-making processes

Within a firm

- Operational: management and control of operational processes
- Managerial: control of weekly differences between budget and actual results
- Strategic: choice of best market areas

Typologies of business Information Systems: OSS

- **Operational Support Systems**
  - Information gathering and organization creating electronic files (product register, customers, …)
  - Processing of transactions (counters, orders, …)
  - Planning of operations (production planning, stock management, …)
  - Management of administrative procedures (customers records, suppliers, …)

Operational activities

- Gather, validate and store data on the business transactions influencing business resources
- Support to operational activities
- Repetitiveness of activities and produced information
- Systems providing periodical detailed reports
- Predictable information in reports
- Information generated by internal documents
- Emphasis on the past
- Strong organization of data

# Systems for operational activities: advantages of automation

- Increase in efficiency:
  - Faster execution of activities
  - Higher accuracy of data
  - Possibility of a better customer service
  - More information available for decision-making processes: data are made available when necessary
  - Cost reduction: quicker production of periodical reports

IT to support operational activities

- Systems supporting operational activities are based on the creation of databases which can keep all data input and perform different operations of data aggregation to produce periodical reports
- It is necessary to plan:
  - The structure of data and the relations among them
  - Data processing procedures to support operational activities and related information flows to be created

---

Systems of Transaction Processing (OLTP)

- Database: stores durable information
- N processing operations: they read and/or write on the database (transactions)

PROCESS 1	PROCESS 2	...	PROCESS N

DATABASE
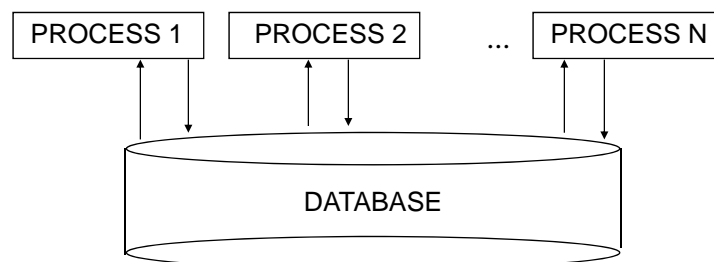
Type of business Information Systems

- **Managerial systems**
  - Supporting activities of management, control and strategic planning (Management Information Systems, MIS, Decision Support Systems, DSS)
  - Flexibility to provide information at various levels of synthesis, according to users' needs (managerial reporting)
  - Allowing user to quickly modify format and contents of produced information (diversified analytical statements)

Tactical activities

- Providing information to control resource allocation and business processes
- Synthetic data, obtained through the analysis of information generated from operational activities and external data
- Creation of ad hoc reports and periodical summary reports
- Comparative, nondescriptive reports, to check possible differences

Activities of strategical planning

- Supporting long term planning
- Information produced on an ad hoc or periodical basis (i.e. quarterly internal balance…)
- Data can be relatively unstructured
- Focus: future prediction
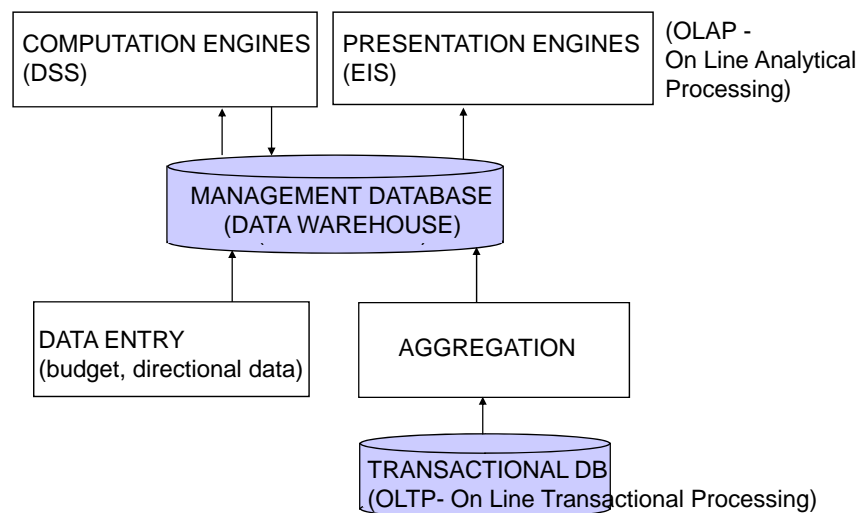- Reports based on external information, also subjective

IT for activities of strategic planning

- DSS (Decision Support Systems) or SIS (Strategic Information Systems) are necessary
- DSS planned to support semi-structured or nonstructured decisions with incomplete information
- DSS enables the application of different decision rules according to context
- DSS supports data access in databases and provides tools for data analysis
- DSS supports all phases of decisional processes: problem modeling, definition of solution alternatives, selection of actions to be undertaken

Components of a DSS

- Data models: data warehouse
- Data mining: intelligent agents to reaggregate data according to different associations
- Tools for data modeling (statistical, financial, ...)
- "Reasoning" tools supporting decision-making, often based on expert systems, specific for application domain
  - Definition of decision-making rules
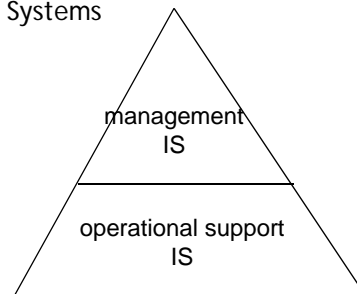 - Definition of knowledge basis

---

Management information systems

| COMPUTATION ENGINES (DSS) | PRESENTATION ENGINES (EIS) | (OLAP - On Line Analytical Processing) |

MANAGEMENT DATABASE (DATA WAREHOUSE)

| DATA ENTRY (budget, directional data) | AGGREGATION |

TRANSACTIONAL DB (OLTP- On Line Transactional Processing)
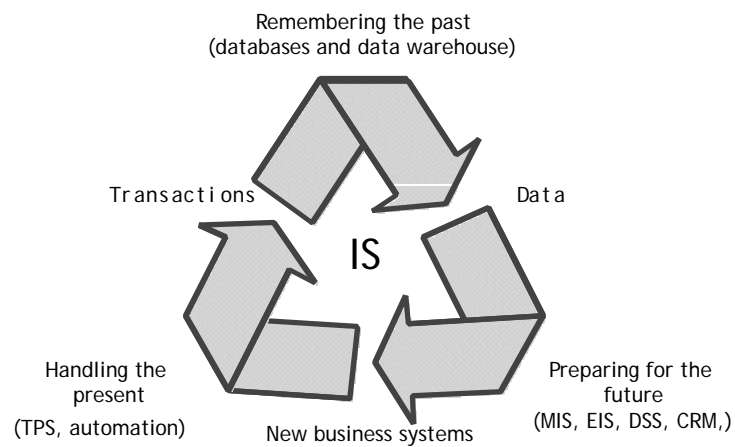
Interrelated and complementary typologies

Example: Manufacturing firm

- Electronic files: to computerize product registers
- Transaction processing and supply chain control, production and sale
- Administrative support systems (processing of accounting transactions)
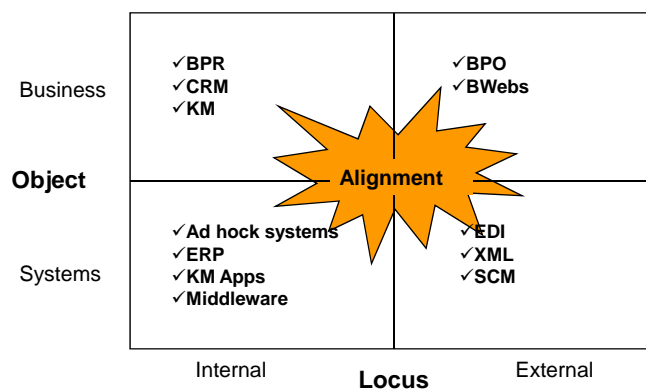- OSS support management Information Systems

```
        management
            IS
     _____
     operational support
            IS
```

The IS Cycle

Remembering the past
(databases and data warehouse)

Transactions

Data

IS

Handling the
present
(TPS, automation)

New business systems

Preparing for the
future
(MIS, EIS, DSS, CRM,)

Integration

The act of making into a whole;
To unify;

The act of joining with something else;
To unite

Integration

	Internal	External
Business	✓BPR ✓CRM ✓KM	✓BPO ✓BWebs
Systems	✓Ad hock systems ✓ERP ✓KM Apps ✓Middleware	✓EDI ✓XML ✓SCM

Object

Alignment

Locus

Business Decentralization

- Post-war growth and decentralization
- Replication and redundancy
- Disconnected units
- "Homegrown" Information Systems

Integration Trends

- Customers demand
  - Speed
  - Self-service
  - Consistency and reliability
  - Flexibility and convenience
- Customer centricity
- Integrated solution
- Global inventory visibility

Integration: The tradeoff

- Business integration: solution?
- Transaction costs:
  - Coordination costs
  - Search costs
  - Contracting costs
- IT reduces transaction costs

Systems Integration

- Integration of IT
  - Applications
  - Databases
- Lack of integration
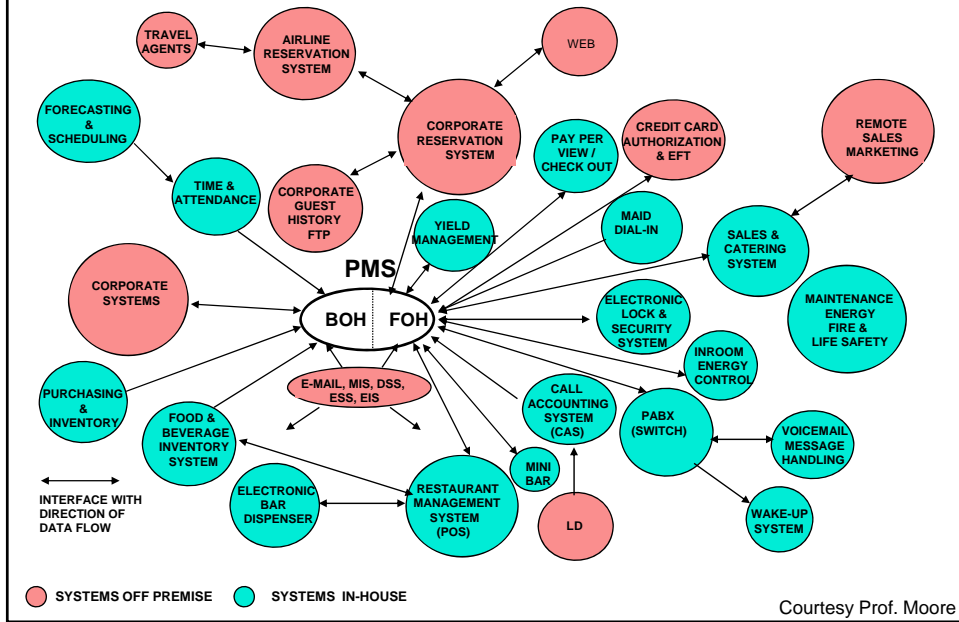 - Stovepipe applications
  - Mergers and acquisitions
  - Cost

Business → Systems Integration

- Ad hoc integration → Interfacing
- BPR → ERP → Integrated SCM
- CRM → BI Infrastructure

Ad hoc → Interfacing

- Interfacing
  - Bilateral linkages
  - Maintenance

The Case of Hotels

Courtesy Prof. Moore

Operations Support Systems

Operations Support Systems - OSS

- Support information exchanges within operational processes:

  - among different companies (Business-to-Business (B2B), BUYSIDE supplying processes)
  - among processes within the same company (internal support to INSIDE production processes)
  - between user and company (Business-to-Customer (B2C), SELLSIDE sales processes)

Management of company's registers or files

- Demographics of customers / suppliers
- Register of products / services
- General register of banks (customers and relations)
- General register of insurance companies (types of contracts and customers)
- City register (certifications, issue of poll books, etc.)

Transaction processing

- Transaction = exchange of goods/ services/ information

  - economic exchanges and contracts (customers' orders)
  - trasformations for production of goods and/or services (product assembly)
  - movements of physical objects (product shipping)
  - certification of events (invoice payments)

Transaction processing

- Examples
  - Flight, hotel and car renting reservations;
  - Operations on bank and post accounts;
  - Invoicing and emission of bills in general;
  - Cashing and payments; stocks sale on the exchange;
  - Receipts of credit card payments;
  - Post sales;
  - Taking/depositing of materials into a warehouse;
  - …

Transaction processing

Goals:

- Automation of manual activities and support to the execution of operations
- User guide in the execution of operations
- Constant updating of databases
- Documentation of transactions

Transaction Processing Information Systems
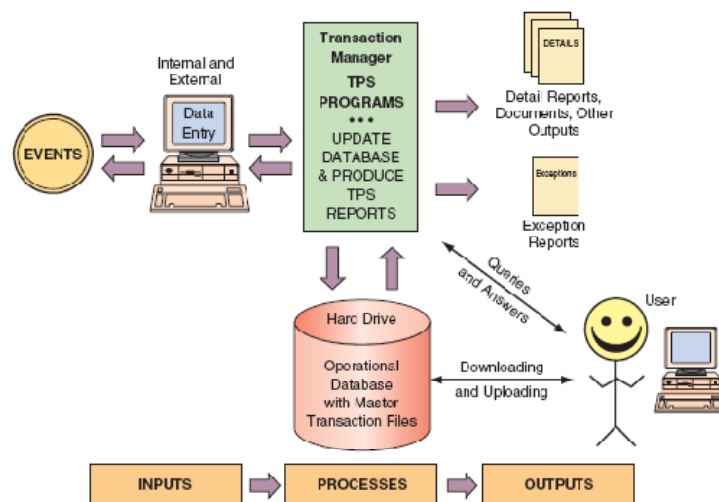
46

Information managed by OSS

- Personal data: they describe structural properties of objects and roles in the system
- Description of transactions: they describe events or movements
- Description of operation planning: they describe the production plan

Type of information managed

- *Stable information about situations* (register of customers, suppliers, products)
- *Changeable information about situations* (bank account balance)

- *Information about events* (description of transactions and component operations)

Description of transaction

- Identification data (code, date, reason of payment, …)
- Descriptive attributes (input, output, text with description, …)

Transaction classes:
- Movements of materials (class)
- Incoming movements (subclass)
- Normal income (elementary transaction)

Transaction Processing Systems

- **Processing operations**: they automize business activities and are made of programs written in proper programming languages

- **Database (DB)**: collecting permanently stored data, properly structured

- **DBMS** (Data Base Management System) **Technology** for the SHARING of the DB from the processes
  - Logical organization of data (according to a defined model)
  - Standardized access to data (query languages, security and integrity of data)

Processing operations

- An IS for transaction processing contains N processing operations
- A processing operation is composed of operations/actions on the DB:
  - update
  - query

Forms of processing

- **Online Transaction Processing - OLTP** (interactive)
  - User-system direct interaction through video terminal and "maps" acting as interface
  - Update/query of the DB (menu, function keys, mouse, windows)
- **Batch Processing** (in lots)
  - Processing of large quantities of data (first form of processing in Information Systems)
  - Input data are stored on magnetic archives; the output is made of prints or recordings on magnetic archives
  - Absence of interaction with the user during the processing
- **Real time**
  - Prompt data processing (i.e., control systems for industrial processes)

Functions of Transaction Processing Systems

- Functions of direct processing, to be started by the final user (primary)
  - request of transaction and update of DB
  - visualization and query of DB
- Functions of system administration (as a support)
  - implementation of DB
  - management of DB
  - security

Planning and control activities

- Annual planning (volumes of production, sales, supplying)
- Operational planning (quantity of materials, quantity of products)
- Scheduling of activities to be carried out (daily, weekly)

Planning and control

- Estimate of the plan of operations and update according to the progress
- Elaboration of the progress of operations referring to the plan
- Examples
  - Systems of production planning and control in manufacturing industry
    (systems for chemical, iron and steel, mechanical industry)
  - Systems of consumption forecasting, transportation planning, supplying (large retail chains, pharmaceutical)
  - Systems of order planning and control of projects (building, shipbuilding, engineering)

Management of administrative procedures

- General book-keeping of customers, suppliers, banks
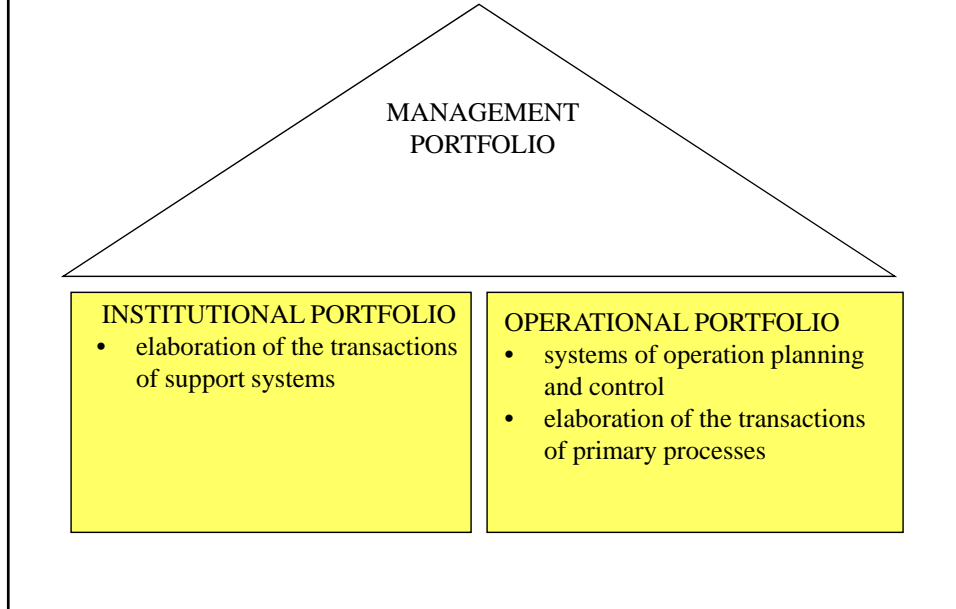
- Procedures of personnel payment

Operations Support Systems and business application portfolio

---

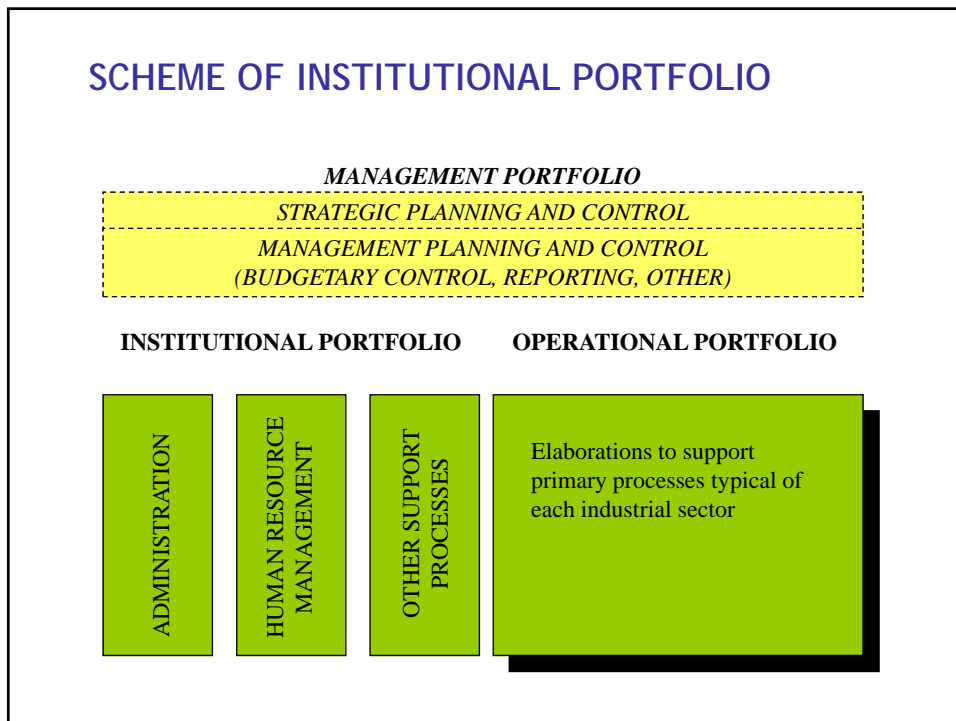## Business application portfolio

- It's the whole of the IT applications in the company
  - **management portfolio** (processes of management and control)
    - strategic planning and control
    - management planning and control of business resources
  - **institutional portfolio** (support processes)
    - administration, book-keeping
    - human resource management
  - **operational portfolio** (primary processes)
    - support to processes of the value chain

O
S
S

GENERAL SCHEME OF ARCHITECTURE

MANAGEMENT
PORTFOLIO

INSTITUTIONAL PORTFOLIO
- elaboration of the transactions of support systems

OPERATIONAL PORTFOLIO
- systems of operation planning and control
- elaboration of the transactions of primary processes

SCHEME OF INSTITUTIONAL PORTFOLIO

MANAGEMENT PORTFOLIO

STRATEGIC PLANNING AND CONTROL

MANAGEMENT PLANNING AND CONTROL
(BUDGETARY CONTROL, REPORTING, OTHER)

INSTITUTIONAL PORTFOLIO   **OPERATIONAL PORTFOLIO**

ADMINISTRATION

HUMAN RESOURCE MANAGEMENT

OTHER SUPPORT PROCESSES

Elaborations to support primary processes typical of each industrial sector

Institutional Portfolio

- HORIZONTAL: independent of the sector of business activities
- Packages for payments, invoicing, book-keeping procedures (in the seventies)
- <u>Integration with operational portfolio</u>, only reference model for human resource and administrative management (ERP systems, in the nineties)

Operational portfolio

- VERTICAL: dependent on the sector of business activities
- Support to primary processes:

  - material supplying (incoming logistics, negotiation, supplying, receipt of goods)
  - product manufacture (management and execution of transformations)
  - sales and distribution (order management, distribution, post-sales)

Transactional Processing Systems (TPS)

- **Transactions**: operating activities which enable the pursuing of business objectives
  - (i.e. purchase of raw materials, production, payment of workers, product shipping, invoicing)

- **TPS**: information system supporting such activities
  - periodically repeated
  - applied on large quantities of detailed analytical data
  - operating on data related to past activities
  - often operating on reserved data

- They generate an output which can be used by other subsystems
  - i.e. for CRM, for electronic commerce, …

EXAMPLE OF PORTFOLIO OF A MANUFACTURING COMPANY
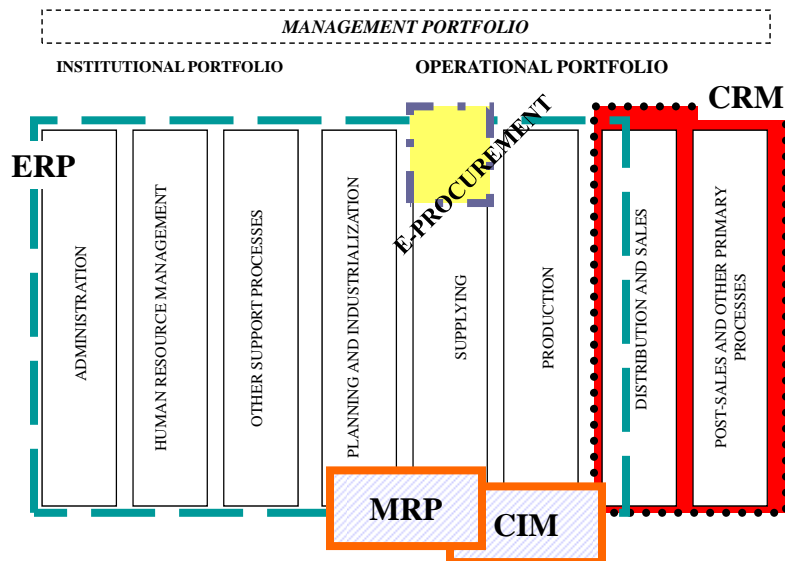
Historical evolution of OSS

- '60 ad-hoc solutions, systems for flight reservations, systems for order management
- '70 systems with databases, integrated packages Manufacturing Resource Planning – MRP for material and production management
- '80 automation of factory, Computer Integrated Manufacturing - CIM
- '90 Enterprise Resource Planning integrated systems, Customer Relationship Management - ERP, CRM
- '00 e-Procurement systems, Internet, Web, browsers --> B2B (CISCO), B2C (Amazon)

BENEFITS

Single procedures: custom projects From 1960 to 1990	• Ad-hoc solution • Classic program languages (i.e. COBOL) • Mainly host processing architectures	• Benefits of replacement: better efficiency in data processing • Local optimization of resources, i.e. smaller stock, less personnel for payments
MRP Manufacturing Resource Planning From 1970 to1995	• Integrated packages • Database • Mainly host processing architectures	• Horizontal and vertical process integration (partial) • Balancing of production factors (machines, stocks, workers) and efficiency of the production process
CIM Computer Integrated Manufacturing Since about 1980	• Integration between processing and management information technology • Real-time processing • Factory networks composed of microprocessors (PLC) and servers of various kind	• Horizontal integration of the factory • Vertical integration among execution and planning phases for factory operations • Elimination of wastes of time and buffer resources, efficiency in manufacturing process, product quality
ERP Enterprise Resource Planning Since about 1990	• Integrated packages with unique data model • Client-server architecture (network since 1997-98)	• Horizontal and vertical process integration • Transformation of internal processes • Efficiency of production factors (see MRP) • Process KPI (quality, timeliness, efficiency)
CRM Customer Relationship Management Since about 1995	• Integrated packages for the whole customer cycle: sales through agents, WEB and call-center, marketing, customer care, invoicing and the like • Client-server and web architecture	• Reduction of transaction costs for the customer • Horizontal and vertical process integration (partial)

E-Procurement
Since about 1995
	• Packages for the whole purchase cycle: research and catalogue, process management via workflow, auctioning, electronic market place
	• I-net architectures and web technologies
		• Trasformation of purchase process of general materials and commodities
		• Reduction of transaction costs
		  1. buyer (semplification of flows)
		  2. seller (access to market)

CIM architecture

- It includes all factory information technology at 5 levels:
  - machine: it guides the execution of physical activities (plate welding carried out by a robot) --> microprocessors, real-time processing
  - cell: it coordinates flows among more machines (welding line) --> pc
  - area: it guides department executive planning (plate pressing) --> local networks
  - factory: it guides production planning and interactions among factories --> factory server
  - company: uniform applications for the whole company --> server with company's databases

CIM : example of FIAT Melfi

production process	• orders to production • programming of technological units of the factory • management of product structure (production bill of materials) • management of target-driven automobile setup • monitoring of stocks in production (Work In Progress) • lead-time check (service time) of customers' orders	The system covers in fact almost all five levels of the CIM scheme, including the management of basic technical data.
management of materials	• planning for suppliers • receipt of goods • delivery progress • distribution to lines	The system covers the segments of the management of materials.
management of workers	• survey of available workers • management of specializations and qualifications for assignment • check of requirements • resource balancing • evaluation of use of workers	The management of workers is aimed at checking and balancing the production plan.
management of equipment	• survey of functional states • analysis of stops and maintenance interventions • execution of maintenance interventions • indicators for "management on demand"	Automation has canceled the traditional distinction between production and maintenance.
quality management	• data gathering from quality control systems • feedback on critical operations • analysis of gathered data	The system strengthens the data gathered by specialized systems.

MRP architecture

- System of software applications to support supplying and production management

  - management of materials and stock
  - planning of requirements
  - production management and control
  - planning of production capacity

  Centralized architectures with databases

MRP PACKAGE : COPICS IBM

MANAGEMENT OF BILL OF MATERIALS	MAIN PRODUCTION PLAN	MANAGEMENT OF PRODUCTION CYCLES

STOCK MANAGEMENT	REQUIREMENT PLANNING	PLANNING OF PRODUCTION CAPACITY

STOCK PLANNING (PARAMETERS)	SHOP ORDER	PURCHASE MANAGEMENT

|	PRODUCTION CONTROL	RECEIPT MANAGEMENT

Systems for production and logistics

- Systems to support **planning and production**
  - CAD, CAE, CAM

- The evolution of **integrated** systems
  - **MRP**: estimate of the components needed for the execution of a specific production plan

  - **MRP II**: resource allocation (costs of components, of labour force, of the infrastructures needed to carry out production activities)

  - **ERP**: modular solution which integrates most business processes through the sharing of important data in a centralized database accessible from all modules

TPS – Managing Production/Operations & Logistics

The production and operations management (POM) function in an organization is responsible for the processes that transform inputs into useful outputs. In comparison to the other functional areas, POM is very diversified as are the supporting TPS. It also differs considerably among organizations.

- A few of the IT supported POM areas are:
  - In-house logistics and materials management
  - Planning production/operations
  - Computer-integrated manufacturing (CIM)
  - Product lifecycle management (PLM)
  - Automating design work and manufacturing

74

TPS – Managing Production/Operations & Logistics
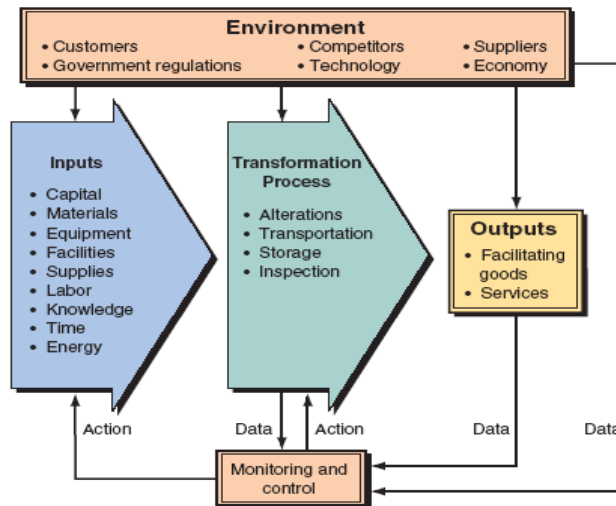
TPS – In-House Logistics & Materials Management

Logistics management deals with ordering, purchasing, inbound logistics (receiving), and outbound logistics (shipping) activities. These logistical activities cross several primary and secondary activities on the value chain.

- Inventory management determines how much inventory to keep. Overstocking can be expensive; so are understock conditions.

- Manufacturing quality-control systems can be stand-alone systems or part of an enterprise-wide total quality management (TQM) effort. They provide information about the quality of incoming material as well as the quality of work-in-process and finished goods.

TPS – Planning Production/Operations

POM planning is a major component of operational systems

- **Material Requirements Planning (MRP)** is software that facilitates the plan for purchasing or producing parts, subassemblies, or materials in the case of interdependent items. It integrates Master Production Schedules, BOM's, and Inventory levels.

- **Manufacturing Resource Planning (MRP II)** adds functionalities to a regular MRP system by determining the costs of parts and the associated cash flow. It also estimates costs of labor, tools, equipment repair, and energy while generating a requirements report.

- **Just-in-Time Systems** is an approach that attempts to minimize waste of all kinds (space, labor, materials, energy, etc.) and to continuously improve processes and systems. The JIT concept is used in mass customization and build-to-order environments.

- **Project Management.** A project is usually a one-time effort composed of many interrelated activities, costing a substantial amount of money, and lasting for weeks or years. Software tools such as: *program evaluation and review technique (PERT)* and the *critical path method* (*CPM*) are used to manage milestones, resources, costs, etc.

- **Work Management Systems (WMS)** automatically manages the prioritization and distribution of work. These systems deal with resource allocation and reallocation.

77

TPS – Computer-Integrated Manufacturing

CIM is a concept that promotes the integration of various computerized factory systems. It has three basic goals: (1) the *simplification* of all manufacturing technologies and techniques, (2) *automation* of as many of the manufacturing processes as possible, and (3) *integration and coordination* of all aspects of design, manufacturing, and related functions via computer hardware and software.

- Typical integrated technologies are:
    - FMS - Flexible-manufacturing systems
    - JIT – Just-in-Time
    - MRP – Materials Requirements Planning
    - CAD – Computer Aided Design
    - CAE – Computer Aided Engineering
    - GT - Group technology

78

TPS – Computer-Integrated Manufacturing
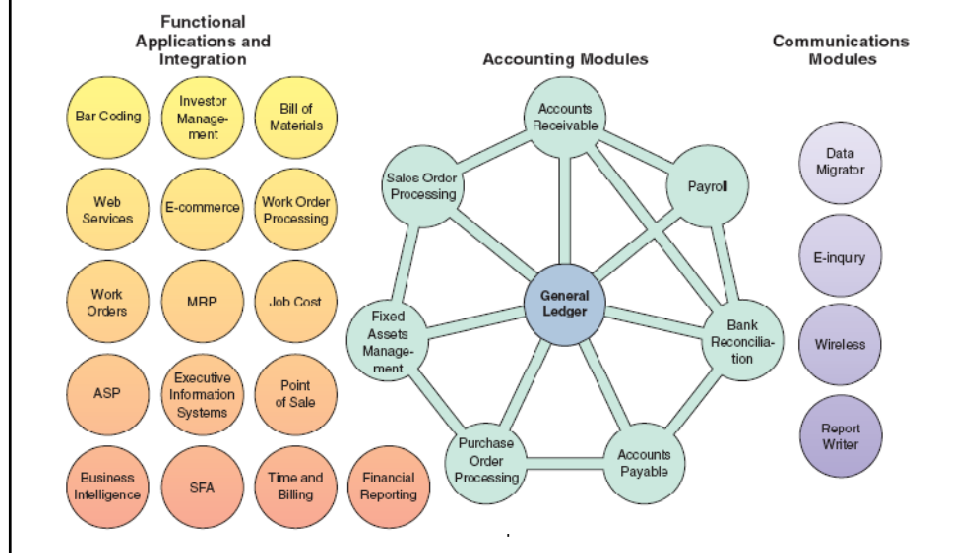
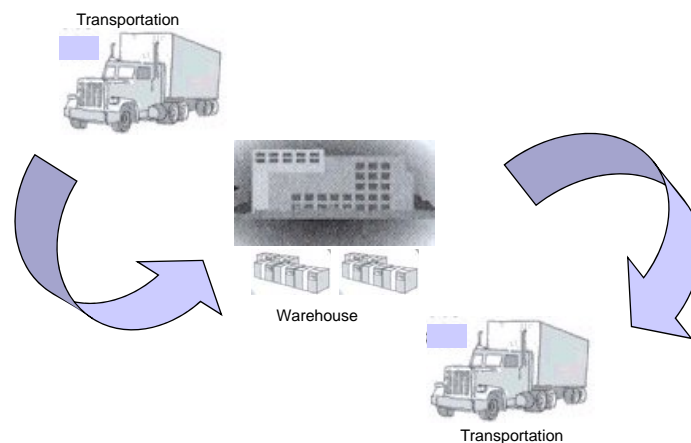# TPS – Product Lifecycle Management

PLM is a business strategy that enables manufacturers to control and share product-related data as part of a products design and development effort. Web-based supply chains and other technologies are employed to automate this collaborative effort.

- *This electronic-based collaboration can reduce*
  - *product cost*
  - *travel expenses*
  - *costs associated with product-change management*
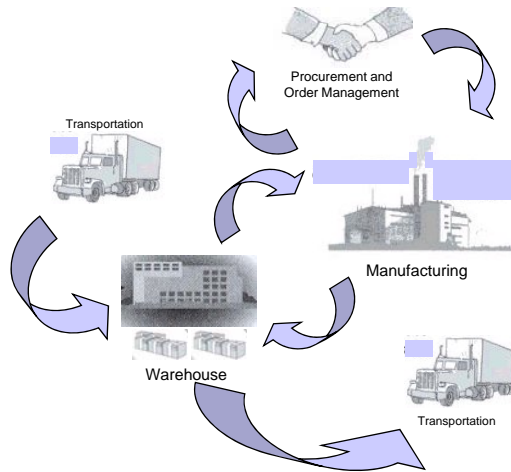 - *time it takes to get a product to market*

Systems for production and logistics/2

- Integration solutions for the information system
  - adopt an ERP system (time, costs, business impact)
  - use an ERP system in ASP mode
  - integrate existing applications

- The evolution towards decisional support
  - "Second-generation" ERP systems: they add support functions to management activities, CRM, …

- Systems to support **Supply Chain** (SCM systems)
  - demand forecast (in aid of production planning)
  - order management (better efficiency and customer service)
  - advanced production planning (APS systems)

First Generation SCM

Transportation

Warehouse

Transportation

Second Generation SCM

Procurement and
Order Management

Transportation

Manufacturing

Warehouse

Transportation

Integrated SCM

Suppliers

Transportation

Order Management
and Procurement

Manufacturing

Warehouse

Transportation

Customers
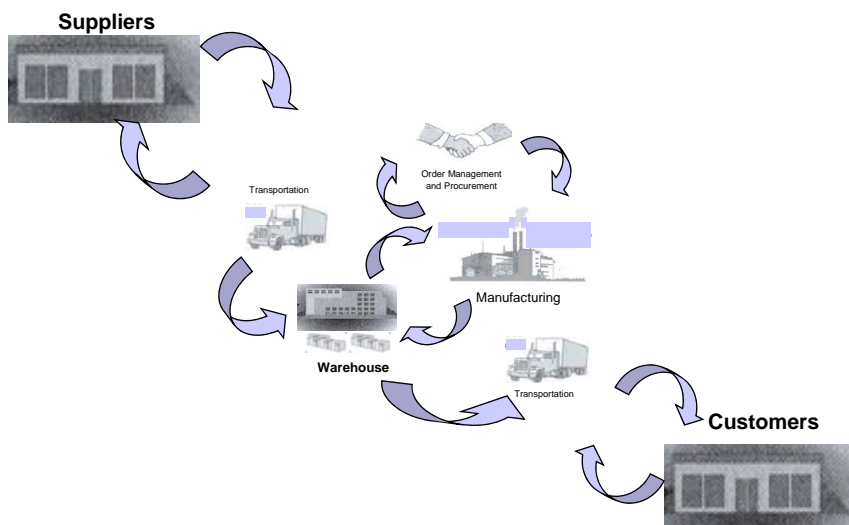
Supply Chain Management

- Before SCM
- Advantages
  - Information integration
  - Planning synchronization
  - Workflow coordination
- Risks

Other operational information systems/

- Systems for **market** analysis
  - as support to commercial activity (sales force automation)
  - for the management of salepersons (incentives, geographical areas …)
  - for the analysis of customers' online behaviour

- Systems for **human resource management**
  - for the management of employees (curriculum, skills, working times, holidays, incentives, career …)
  - for personnel research (cv archives on the internet)
  - for personnel training (training planning, eLearning solutions at intranet level …)
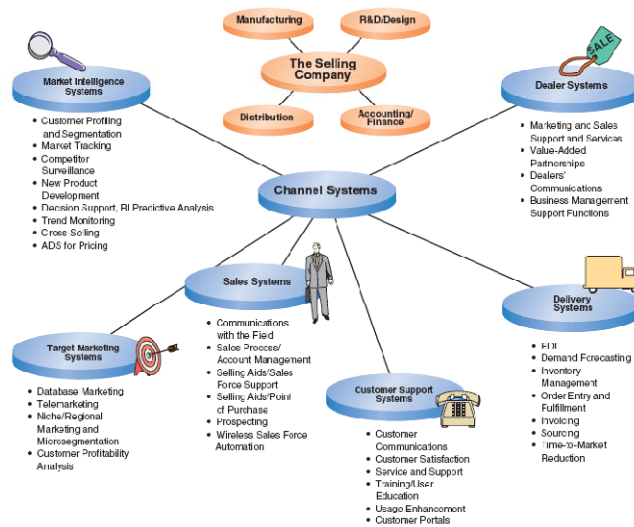
TPS – Product Lifecycle Management

Figure 7.4 Marketing channel systems.

TPS – Marketing and Sales Systems

Channel systems are the TPS involved in the process of getting a product or service to customers and dealing with their needs. These systems link and transform marketing, sales, procurement, logistics, and delivery activities with other corporate functional areas.

- *Some of the channel-system activities are:*
  - customer relations
  - distribution channels and in-store innovations
  - marketing management
  - telemarketing

TPS – Customer Relations

It is essential for companies to know who their customers are and to treat them properly. Innovative products and services, successful promotions, customization, and customer service are a necessity for most organization.

- **Customer Profiles and Preference Analysis.** Sophisticated information systems are being developed to collect data on existing and potential customers, their demographics (age, gender, income level), and preferences.
- **Prospective Customer Lists and Marketing Databases.** All firms need to know and track who their existing and potential customers are. These prospective-customer lists can be analyzed and sorted by classification for direct mailing, e-mailing, or telemarketing.
- **Mass Customization.** Today's customers prefer customized products. Through *mass customization, the* practice of maintaining WIP inventory, manufacturers can offer different product configurations at reasonable prices.
- **Personalization.** Special product offers are made, based on where the customer spent their time and on what they may have purchased.
- **Advertising and Promotions.** Special promotions or coupons are presented to the customer via mails, email, wireless and pervasive computing applications.

89

TPS – Distribution Channels & In-Store Innovations

Organizations can distribute their products and services through a variety of delivery channels. A company may use its own outlets, mfg. Representatives, or distributors (to name a few).

- **IT-Supported Distribution Channels**
  - Internet
  - Location Based Mapping
  - Self-service convenience stores
- **Improving Shopping and Checkout at Retail Stores**
  - Hand-held wireless devices that scan the bar code UPC
  - Smart card or credit card
  - Information kiosk enable customers to view catalogs in stores
  - Self-checkout machines
  - Check-writers attached to cash registers
  - Computerization of various activities in retail stores
  - Video-based systems count and track shoppers in a physical store

90

TPS – Marketing Management

Many marketing management decision applications are supported by computerized information systems.

- **Pricing of Products or Services.** Sales volumes are largely determined by the prices of products or services as is profit.
- **Salesperson Productivity.** Salespeople differ from each other in selling skill. Sales-force automation increases salesperson productivity by providing them with mobile devices, access to information, etc.
- **Profitability Analysis** profit contribution of certain products and services can be derived from cost-accounting systems
- **Sales Analysis And Trends**. Marketing. TPS collect sales figures that can be searched for trends and relationships.
- **New Products, Services, and Market Planning**. New products and services can be an expensive risk. "Will it sell?" Requires careful analysis, planning, forecasting, and market research.
- **Web-Based Systems** support marketing and sales through data capture

91

TPS – Accounting and Finance Systems

Accounting and finance functional areas manage the inflow and outflow of organizational assets. This involves all functions of an organization including payroll, billing, cash management, etc.

- Financial Planning and Budgeting
    - Financial and Economic Forecasting
    - Planning for Incoming Funds
    - Budgeting
    - Capital Budgeting
- Managing Financial Transactions
    - Financial and Economic Forecasting
    - Planning for Incoming Funds
    - Budgeting
    - Capital Budgeting

92

TPS – Accounting and Finance Systems (Continued)

- E-Commerce Applications of Financial Transactions
  - Global stock exchanges and multiple currencies
  - E-Bonds
  - Factoring online
  - Electronic re-presentment of checks
  - Electronic bill presentment and payments
- Virtual Close
- Expense Management Automation
- Investment Management
  - Financial Analysis
  - Access to Financial and Economic Reports
- Control and Auditing
  - Budgetary Control and Auditing
  - Financial Ratio Analysis
  - Profitability Analysis and Cost Control
  - Product Pricing

93

TPS – Human Resources Systems

Web-based systems have increased the popularity of human resources information systems which provide applications mainly related to acquiring, hiring, rewarding, developing, training, protecting and retaining human resources.

- Recruitment is finding employees, testing them, and deciding which ones to hire. The Web has enhanced the recruitment process.
  - Position Inventory
  - HRM Portals and Salary Surveys
  - Employee Selection
- Human Resources Maintenance and Development
  - Performance Evaluation
  - Training and Human Resources Development

94

TPS – Human Resources Systems (Continued)

- Human Resources Planning and Management
  - Personnel Planning
  - Labor –Management Negotiations
  - Payroll and Employees' Records
  - Benefits Administration
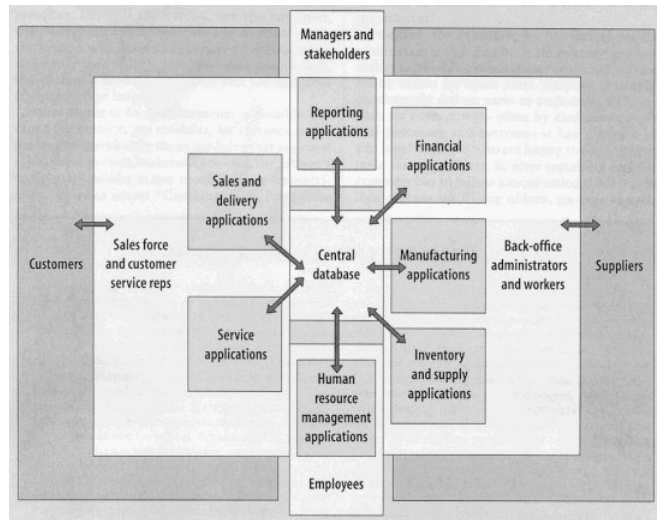 - Employee Relationship Management

ERP Systems

Integrated systems of modules for
- personnel and administrative management
- They include MRP functions (supplying and production)
- sales and distribution management
- post-sales and maintenance management

ERP Suites

Davenport, 1998

ERP GENERAL FUNCTIONS

HUMAN RESOURCE MANAGEMENT

- Personnel Management
- Organization Management
- Payroll Accounting
- Time Management
- Personnel Development

LOGISTICS

- Product Data Management   **MRPI**
- Production Planning & Control
- Materials Management
- Plant Maintenance
- Quality Management
- Project System
- Sales & Distribution
- Service Management

FINANCIAL MANAGEMENT

- Financial Accounting
- Treasury
- Controlling
- Enterprise Controlling
- Investment Management

47

ERP Systems: EXAMPLE

Integration of order-delivery cycle:

- The customer issues an order, which is received by the distributor and inserted into the information system.
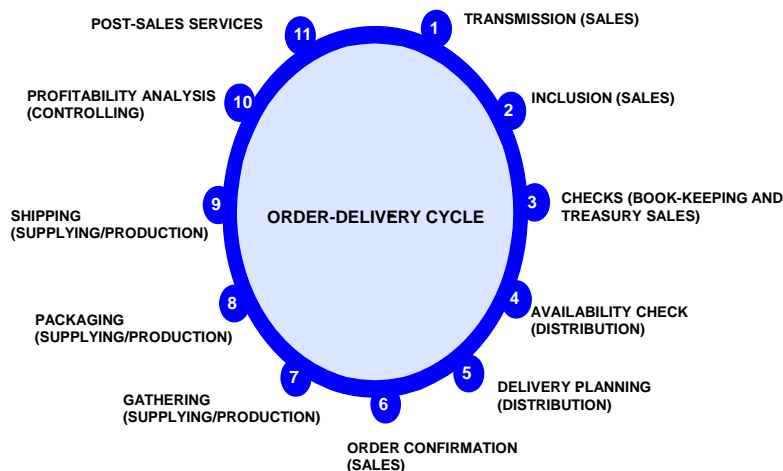- A series of controls is started on the formal correctedness of the order, the customer's solvency and the availabilty of material (should the ware be not immediately available, it is necessary to check supplying plans), the delivery feasibility (preparation and shipping) on the basis of the delivery plan.
- If the order passes this series of checks, it is confirmed and taken over by the commercial area of the logistics dealing with the physical preparation of the order itself. In this phase, the order is processed and becomes a list (picking-list) to allow the collecting.
- After the collecting and check of the wares, the order is consolidated, packaged and shipped to the customer (distribution department).

ORDER-DELIVERY CYCLE

POST-SALES SERVICES — 11

TRANSMISSION (SALES) — 1

PROFITABILITY ANALYSIS (CONTROLLING) — 10

INCLUSION (SALES) — 2

ORDER-DELIVERY CYCLE

CHECKS (BOOK-KEEPING AND TREASURY SALES) — 3

SHIPPING (SUPPLYING/PRODUCTION) — 9

PACKAGING (SUPPLYING/PRODUCTION) — 8

AVAILABILITY CHECK (DISTRIBUTION) — 4

GATHERING (SUPPLYING/PRODUCTION) — 7

DELIVERY PLANNING (DISTRIBUTION) — 5

ORDER CONFIRMATION (SALES) — 6
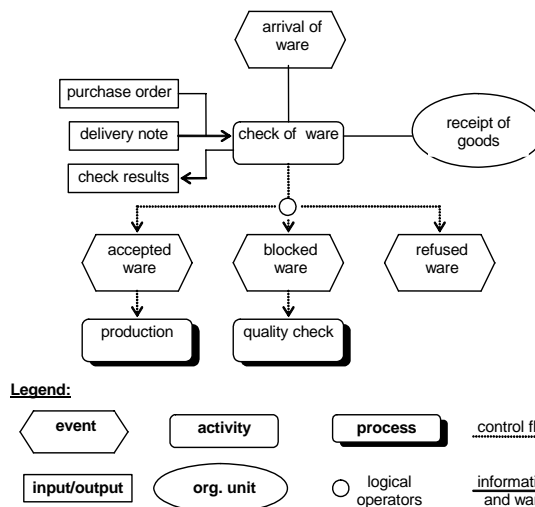
Characteristics of ERP

- Pre-defined model of organizational processes (event-driven)
  - Events
  - Activities to be carried out
  - Involved organizational units
  - Necessary information
  - Information exchanges among processes
- Acceleration of operational cycles
- Information sharing
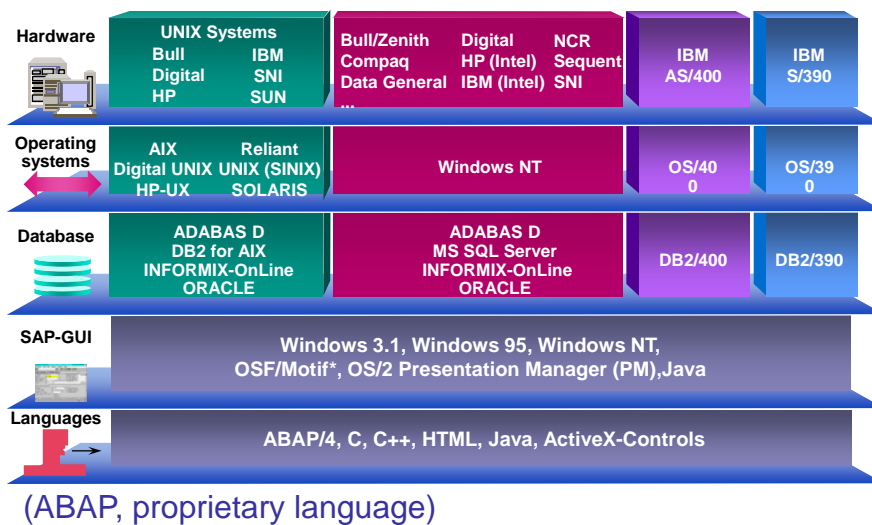- Parametrization as adaptation to the specific company (BPR)

SCHEME OF ERP PROCESS

ERP Architecture

- Client-server architecture
- DB shared among all modules, 3 levels
  - db server, data management
  - application server, data processing management
  - presentation server, interface management
  - (>50% European companies have installed one or more ERP modules for internal process management)

SAP PLATFORMS

Hardware	**UNIX Systems** Bull IBM Digital SNI HP SUN	**Bull/Zenith** **Digital** **NCR** Compaq HP (Intel) Sequent Data General IBM (Intel) SNI ...		**IBM AS/400**	**IBM S/390**
Operating systems	**AIX** **Reliant** Digital UNIX UNIX (SINIX) HP-UX SOLARIS	**Windows NT**		**OS/400**	**OS/390**
Database	**ADABAS D** DB2 for AIX INFORMIX-OnLine ORACLE	**ADABAS D** MS SQL Server INFORMIX-OnLine ORACLE		**DB2/400**	**DB2/390**
SAP-GUI	**Windows 3.1, Windows 95, Windows NT, OSF/Motif*, OS/2 Presentation Manager (PM),Java**				
Languages	**ABAP/4, C, C++, HTML, Java, ActiveX-Controls**				

(ABAP, proprietary language)

Other operational information systems

- Geographical Information Systems
  - They manage information through graphical interfaces representing digitalized maps
  - Examples of applications
    - planning of the routes of a transport company
    - positioning of a sales point related to customers' data
    - definition of military strategies
    - positioning of expensive medical equipment
    - …

Knowledge Management Systems

- **Document** Management Systems (DMS)
  - Focused on **document management**: shared archiving, version management
- **Content** Management Systems (CMS)
  - Focused on the **contents** of documents, indexed and linked to more or less sophisticated search engines
- **Learning** Management Systems (LMS)
  - Focused on **training** activities (tools for course management and to support eLearning activities)
- **Knowledge** Management Systems (KMS)
  - Functions for **knowledge representation and transfer** (i.e. archive of ended projects)