

Management Information Systems

Foundations of Information Systems

Learning objectives

- what are (business / management) information systems?
- levels of decision making
 - strategic
 - tactical
 - operational
- decision making process
- understand the different types of information systems:
 - business IS
 - functional IS
 - enterprise IS

Business Information Systems

Foundations of Information Systems

Business information & decision making

business information system (BIS)

- ▶ Business information systems (BIS)
 - ▶ Improve productivity
 - ▶ Enhance efficiency
 - ▶ Reduce costs
- ▶ Business intelligence (BI)
 - Data Warehouses
 - Data Marts
 - Data mining

business resource base

Physical resources

- ▶ money, land, buildings, labour, technology

Intangible resources

- ▶ experience, motivation, judgement, knowledge, ideas

Business environment

“All business organizations operate within an **environment** that influence the way the organization operates in”

Physical environment

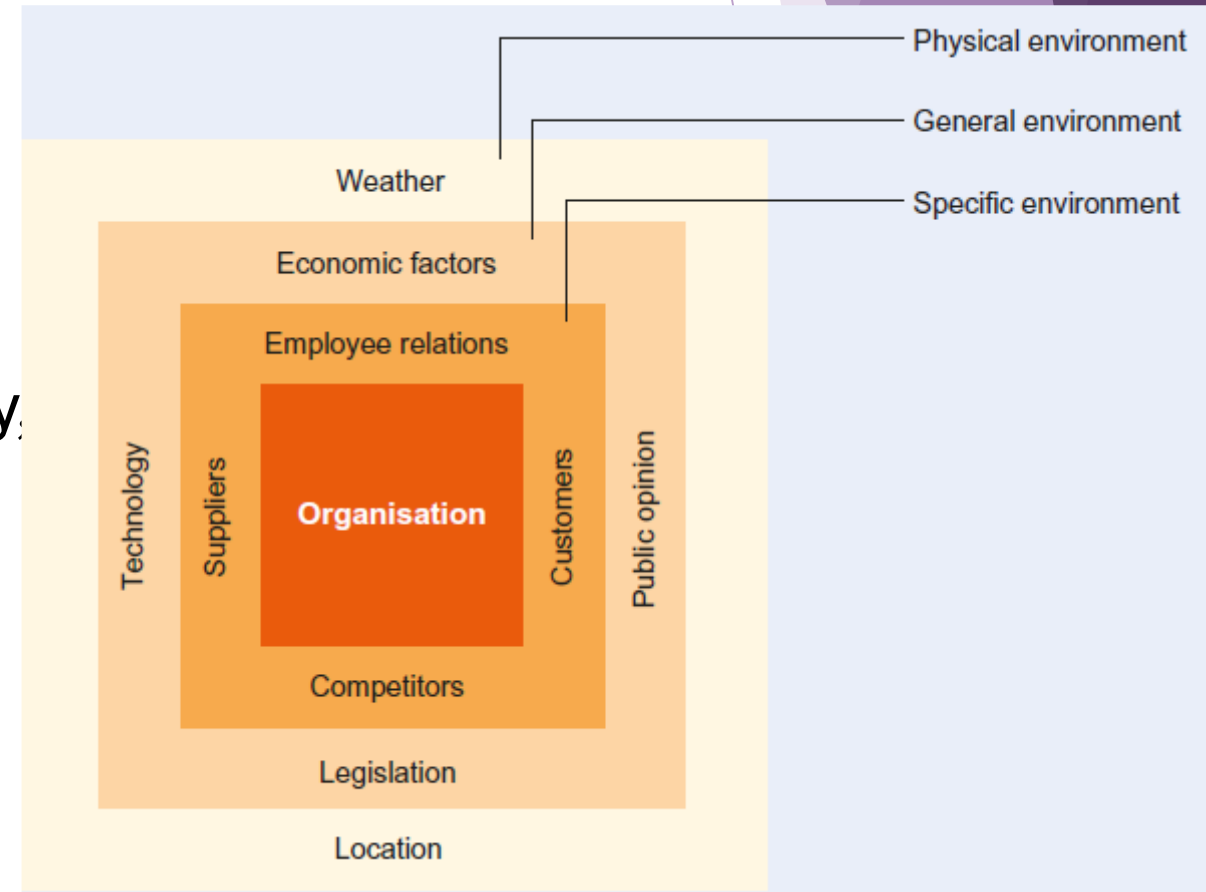
- ▶ Location

General environment

- ▶ Legislation - economic factors, technology, opinion

Specific environment

- ▶ Employees, customers, suppliers, competition



decision making

1. How managers use information
2. Levels - operational, tactical, strategic
3. Decision-making - process
4. Decision-making - theory
5. Knowledge management

manage

- ▶ Forecast & plan
- ▶ Organize, coordinate & control
- ▶ Information systems support management & decision-making
- ▶ Decision-making -> planning activities
- ▶ Need high quality information

organization

- ▶ Well-defined hierarchy , authority
- ▶ Division of labour (functional)
- ▶ Rules & procedures

- ▶ Increased size = increased complexity
 - ▶ Difficult to manage & control
- ▶ Larger size organization >
 - ▶ greater need for an information system

structured decisions

Rules & constraints known

- ▶ Routine
 - ▶ Re-ordering stock
- ▶ Analytical
 - ▶ can provide justification



unstructured decisions

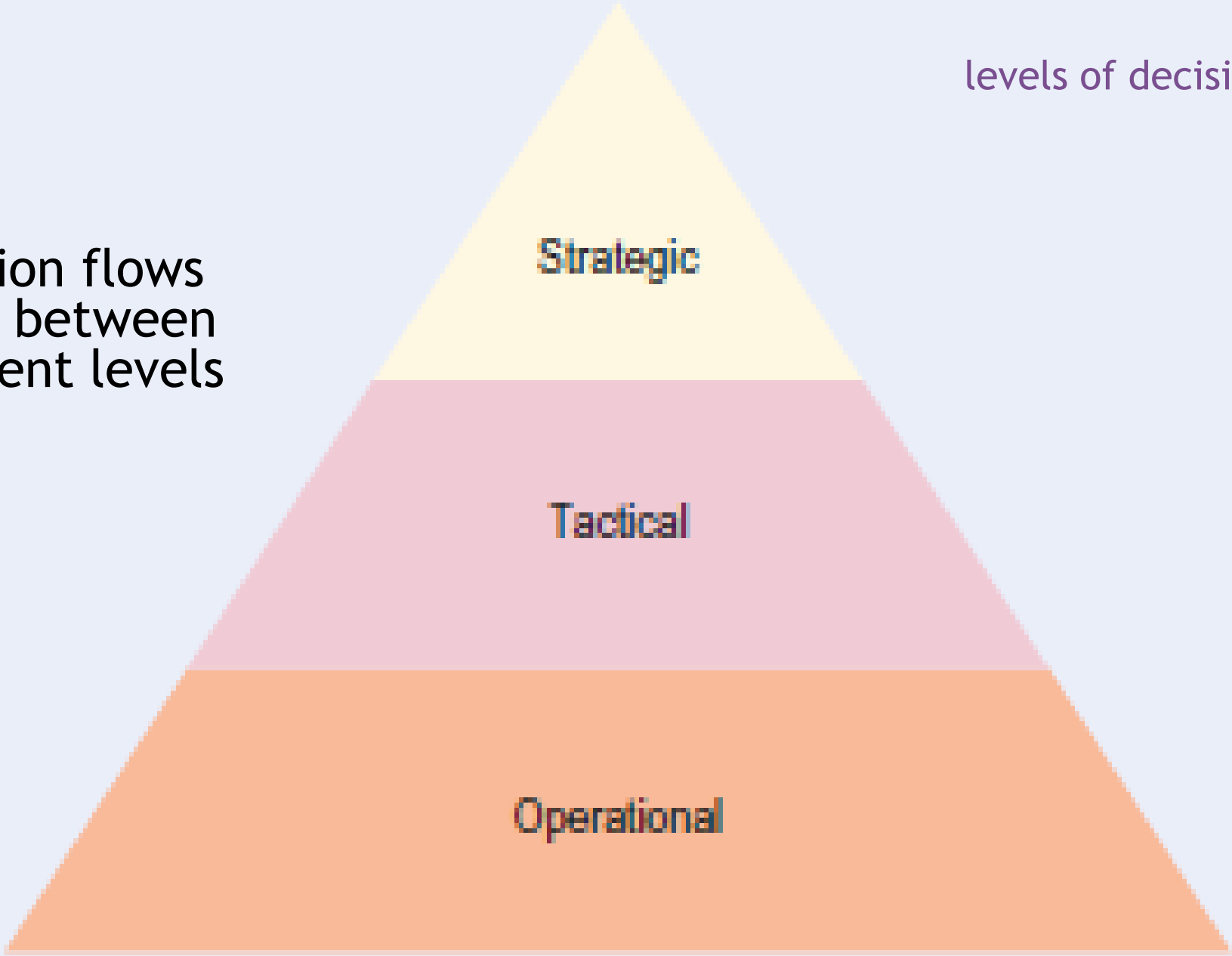
More complex

- ▶ Rely on experience, judgement, knowledge
 - ▶ E.g. open a new branch?
- ▶ intuitive
 - ▶ Based on experience



levels of decision making

Information flows vertically between management levels



Strategic

Tactical

Operational

strategic level

Top managers concerned with **strategic** or long-term planning and decisions

- ▶ Unstructured
- ▶ Infrequent
- ▶ Large impact
 - ▶ e.g. new market



Strategic

tactical level

Middle level managers who make decisions to **implement the strategic goals** set for the organization

- ▶ Medium term planning
- ▶ Monitor performance
- ▶ Budget & resources
- ▶ Set policies - apply to meet strategic goals
- ▶ e.g. set department budget



operational level

Low-level supervisors make **daily operational decisions**

- ▶ Short term, day-to-day control
- ▶ Meet the tactical goals
- ▶ Highly structured, little impact (organization-wide)
- ▶ e.g. daily schedule



Operational

decision making process

Stage	Activities
Intelligence	<ul style="list-style-type: none">■ Awareness that a problem exists■ Awareness that a decision must be made
Design	<ul style="list-style-type: none">■ Identify all possible solutions■ Examine possible solutions■ Examine implications of all possible solutions
Choice	<ul style="list-style-type: none">■ Select best solution
Implementation	<ul style="list-style-type: none">■ Implement solution
Evaluation	<ul style="list-style-type: none">■ Evaluate effectiveness or success of decision

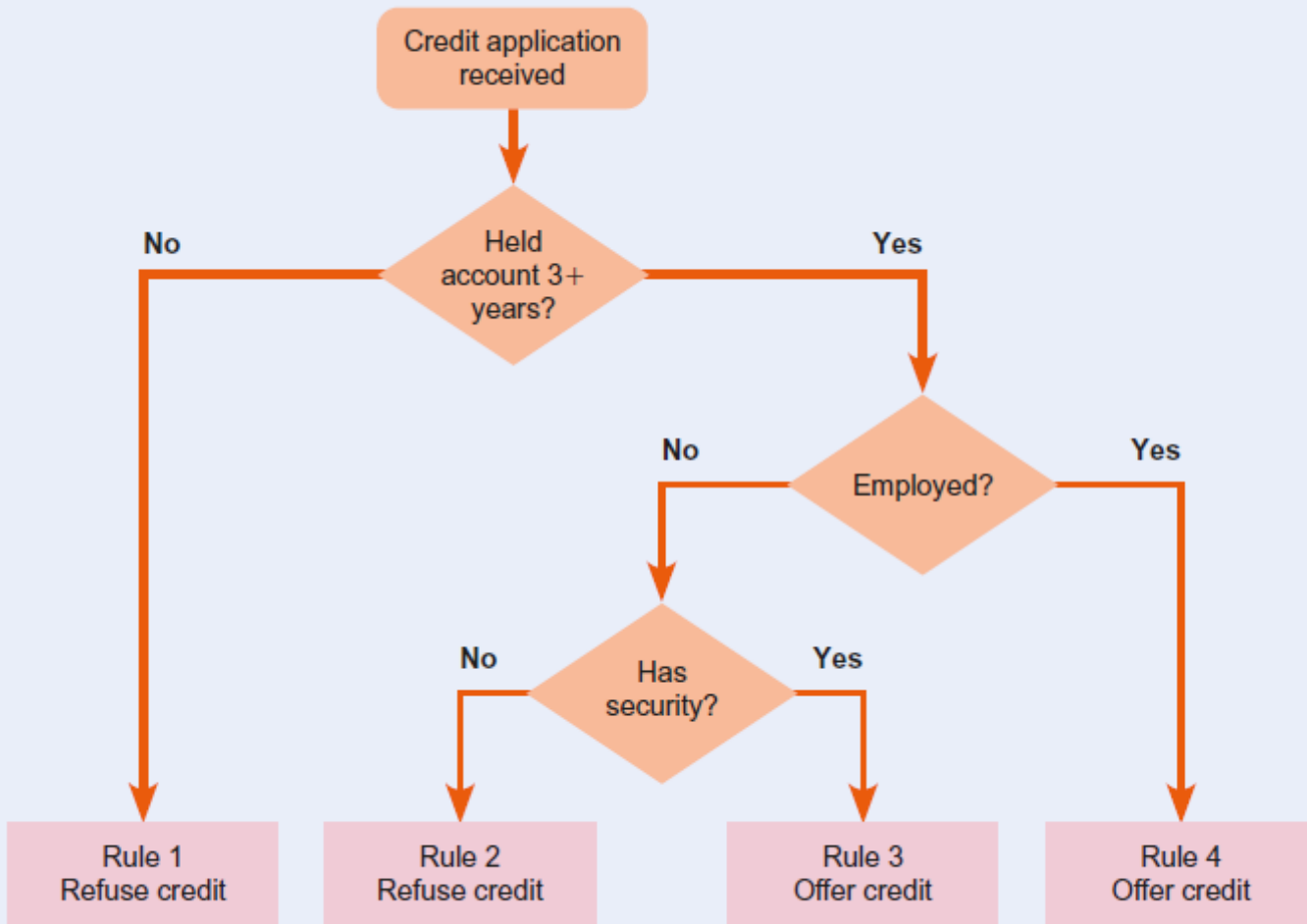
decision making theory

Structured decisions

rules, constraints are known, clear needs
maybe automated (to business rules)

Situation arises = action taken

- ▶ event trigger
- ▶ condition , test Yes or No ?
- ▶ action taken



Decision tree / decision table

		Rules			
		1	2	3	4
Conditions	Account 3+ years	N	Y	Y	Y
	Employed	–	N	N	Y
	Security	–	N	Y	–
Actions	Offer credit			X	X
	Refuse credit	X	X		

Business rule -> code

```
IF Held Account 3+ Years THEN
  IF Employed THEN
    Accept Application                                (Rule 4)
  ELSE
    IF Can Offer Security THEN
      Accept Application                            (Rule 3)
    ELSE
      Decline Application                          (Rule 2)
    ENDIF
  ENDIF
ELSE
  Decline Application                                (Rule 1)
ENDIF
```

ENDIF

Knowledge management

- ▶ Collect data
- ▶ Transform into information
- ▶ Convert into a form that allows sharing & understanding

knowledge management (KM) system

- ▶ A range of activities to use resources efficiently
- ▶ Improve employee performance & organization competitiveness as it:
 - ▶ Selects, distils,
 - ▶ stores, organizes,
 - ▶ packages & communicates information

knowledge management (KM)

How to deal with loss of key personnel?

- ▶ Store & access this knowledge
- ▶ With a effective KM program
 - ▶ Foster innovation
 - ▶ Improve customer service
 - ▶ Boost revenue (speed)
 - ▶ Enhance staff retention (value)
 - ▶ Reduce costs (reuse, reduce redundancy)

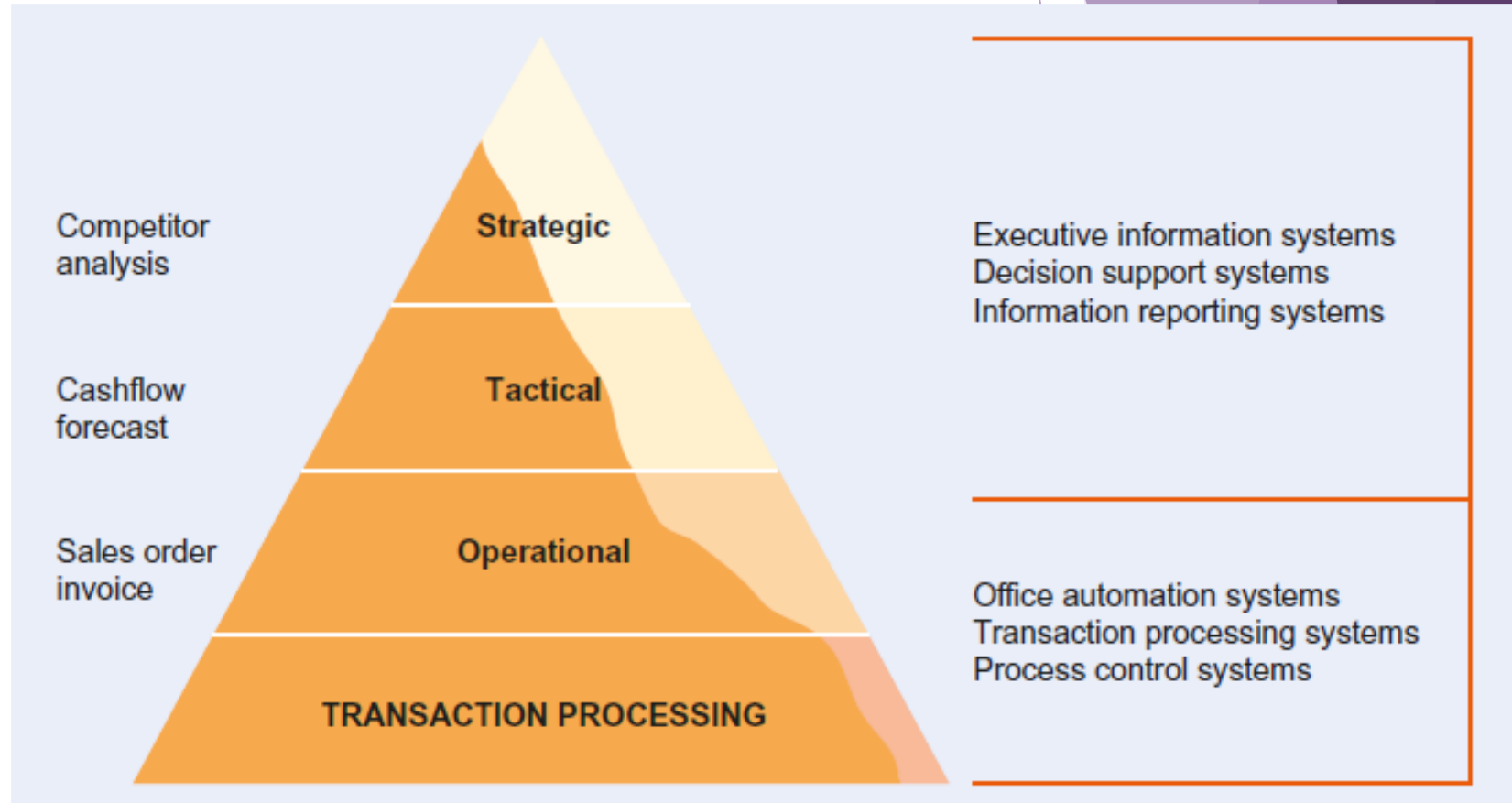
KM applications

- ▶ Business intelligence
 - ▶ Gather, store and analyse information
- ▶ digitalize
 - ▶ PDFs, document image processing (DIP)
- ▶ Data mining
 - ▶ finding patterns, data relationships
- ▶ Competitive intelligence (for decision-making)
 - ▶ Collecting useful information, analysis,
 - ▶ markets, competition, technologies

BIS & decision-making

BIS are well suited to decisions at operational level

- ▶ with a high degree of structure, and
- ▶ frequent access to highly detailed information
- ▶ not strategic level
 - ▶ unstructured decision making
 - ▶ based on qualitative data



Types of Information Systems

What exactly is a Management Information System ?

- Information systems
- Business Information systems
- Management Information systems
- Computerized Information systems
- Department / Functional Information systems
- Enterprise Information systems

confused - you are not alone!

A **business information system (BIS)** is a group of interrelated components that work collectively to carry out input, processing, output, storage and control actions in order to convert data into information products that can be used to **support forecasting, planning, control, coordination, decision making and operational activities** in an organization.

information systems

Table 2.1 Categories of computer-based information systems

Operations information systems

Transaction processing systems

Process control systems

Office automation systems

Management information systems

Decision support systems

Information reporting systems

Executive information systems

Competitor analysis

Strategic

Executive information systems
Decision support systems
Information reporting systems

Cashflow forecast

Tactical

Sales order invoice

Operational

Office automation systems
Transaction processing systems
Process control systems

TRANSACTION PROCESSING

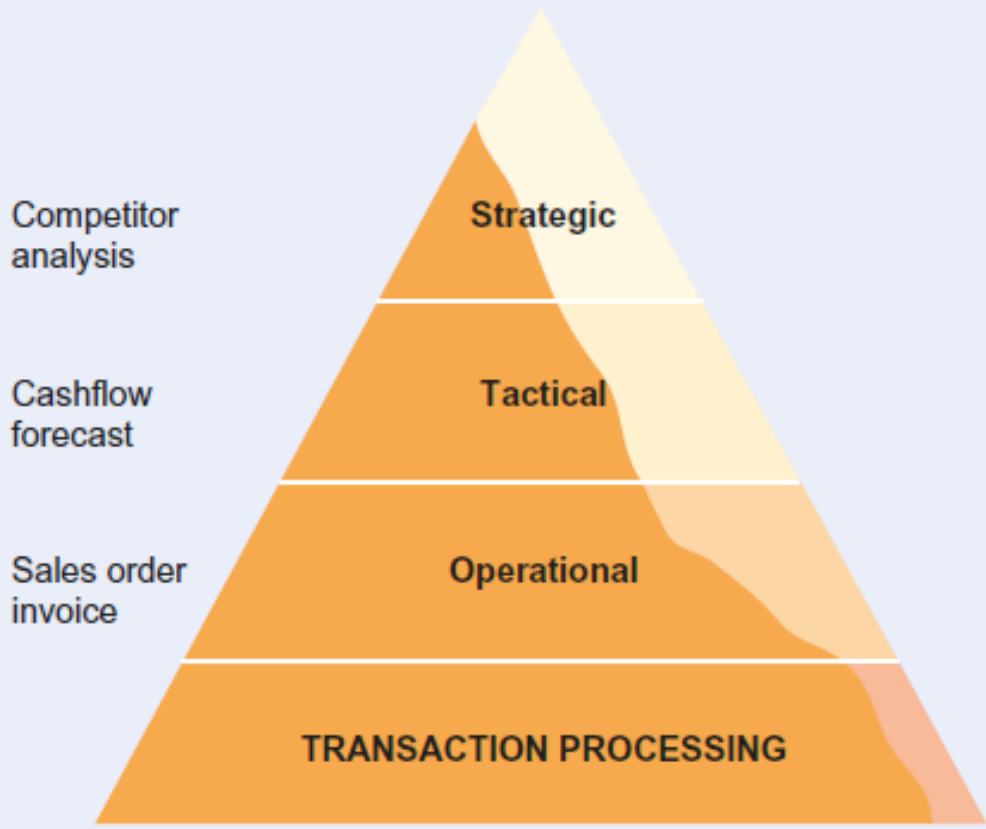
Table 2.1 Categories of information systems

Operations information systems

Transaction processing systems

Process control systems

Office automation systems



Executive information systems
Decision support systems
Information reporting systems

Information systems

Management information systems

Decision support systems

Information reporting systems

Executive information systems

Types of Information Systems

1. Operational information systems

- ▶ Office , Transactional (TPS), e-commerce, B2B, B2C, etc.

2. Management information systems

- ▶ Functional information systems

- ▶ departmental

- ▶ Accounts, finance, HR, marketing, sales, production

- ▶ Enterprise information systems

- ▶ Organization-wide

information systems

Operations information systems

- ▶ process control, transaction processing, communications (internal and external) and productivity

Management information systems

- ▶ help support managerial decision making and
- ▶ provide feedback on organizational activities

Office Information Systems

Office Information Systems

Electronic Publishing Systems

- Word processing
- Desktop publishing
- Copying systems

Electronic Communications Systems

- Electronic mail
- Voice mail
- Facsimile
- Desktop videoconferencing

Electronic Collaboration Systems

- Electronic meeting systems
- Collaborative work systems
- Teleconferencing
- Telecommuting

Image Processing Systems

- Electronic document management
- Other image processing
- Presentation graphics
- Multimedia systems

Office Management Systems

- Electronic office accessories
- Electronic scheduling
- Task management

Transaction Processing Systems

- ▶ transactions are recorded events of routine business activities such as bills, orders, and inventory
- ▶ keep track of the transactions needed
- ▶ track business activities by operational managers
- ▶ Transactions database provides the basis for
 - ▶ management information systems and
 - ▶ decision support systems

Transaction Processing system (TPS)

- ▶ Monitoring, collecting, storage, processing of data from business transactions
- ▶ Real time
- ▶ ‘critical systems’ - support core operations

e-commerce

- ▶ using technology to conduct business transactions, such as buying and selling goods and services
- ▶ Several activities e.g. after-sales support

“online spending represented 21.3% of total US retail sales for the year”

<https://www.digitalcommerce360.com/article/us-ecommerce-sales/#:~:text=Online%20spending%20represented%2021.3%25%20of,to%20Digital%20Commerce%20360%20estimates.&text=That's%20the%20highest%20annual%20U.S.,the%2015.1%25%20jump%20in%202019.>

e-business

E-business can be described as using ICT, especially the Internet, to conduct business

“The process of using web technology to help businesses streamline processes, improve productivity and increase efficiencies.

Enables companies to easily communicate with partners, vendors and customers, connect back-end data systems and transact commerce in a secure manner.”

IBM

Examples of E-Commerce

Type	Purpose	Example Web Sites
E-Retail	E-retail , also called <i>e-tail</i> , occurs when retailers use the Web to sell their products and services.	amazon.com shopping.yahoo.com shopzilla.com
Finance	Online banking allows users to pay bills from their computer or mobile device, that is, transfer money electronically from their account to a payee's account such as the electric company or telephone company. With online trading , users invest in stocks, options, bonds, treasuries, certificates of deposit, money markets, annuities, mutual funds, and so on — without using a broker.	vanguard.com fidelity.com e-trade.com
Travel	The Web provides many travel-related services. If you need directions, you simply enter a starting point and destination, and many Web sites provide detailed directions along with a map. Users can make airline reservations and reserve a hotel or car.	orbitz.com priceline.com kayak.com
Entertainment and Media	Music, videos, news, sporting events, and 3-D multiplayer games are a growing part of the Web's future. Newsprint on the Web is not replacing the newspaper, but enhancing it and reaching different populations.	itunes.com youtube.com nytimes.com
Health	Many Web sites provide up-to-date medical, fitness, nutrition, or exercise information. Some Web sites offer the capability to listen in on health-related seminars and discussion.	webmd.com health.gov familydoctor.com drugstore.com

advantages of e-business

Production processes

- ▶ procurement, ordering stock, payment processing, links with suppliers and production control.

Customer-focused processes

- ▶ including marketing, selling via the Internet, customer support and processing of customer orders and payments.

Internal management processes

- ▶ including training, recruitment, internal information sharing and other employee services.

e-business benefits

- ▶ include reduced costs, improved efficiency and access to larger markets.
- ▶ Automation results in lower production costs
- ▶ Also, improved
 - ▶ customer-focused processes
 - ▶ management processes

e-business

1. *Business-to-business (B2B)*. between companies

Approx. 80 per cent of all e-commerce

source: <https://courses.lumenlearning.com/boundless-business/chapter/e-commerce/>

2. *Business-to-consumer (B2C)*. sell products directly to consumers

3. *Consumer-to-consumer (C2C)*. e.g. online auction sites

4. *Business-to-government (B2G)*

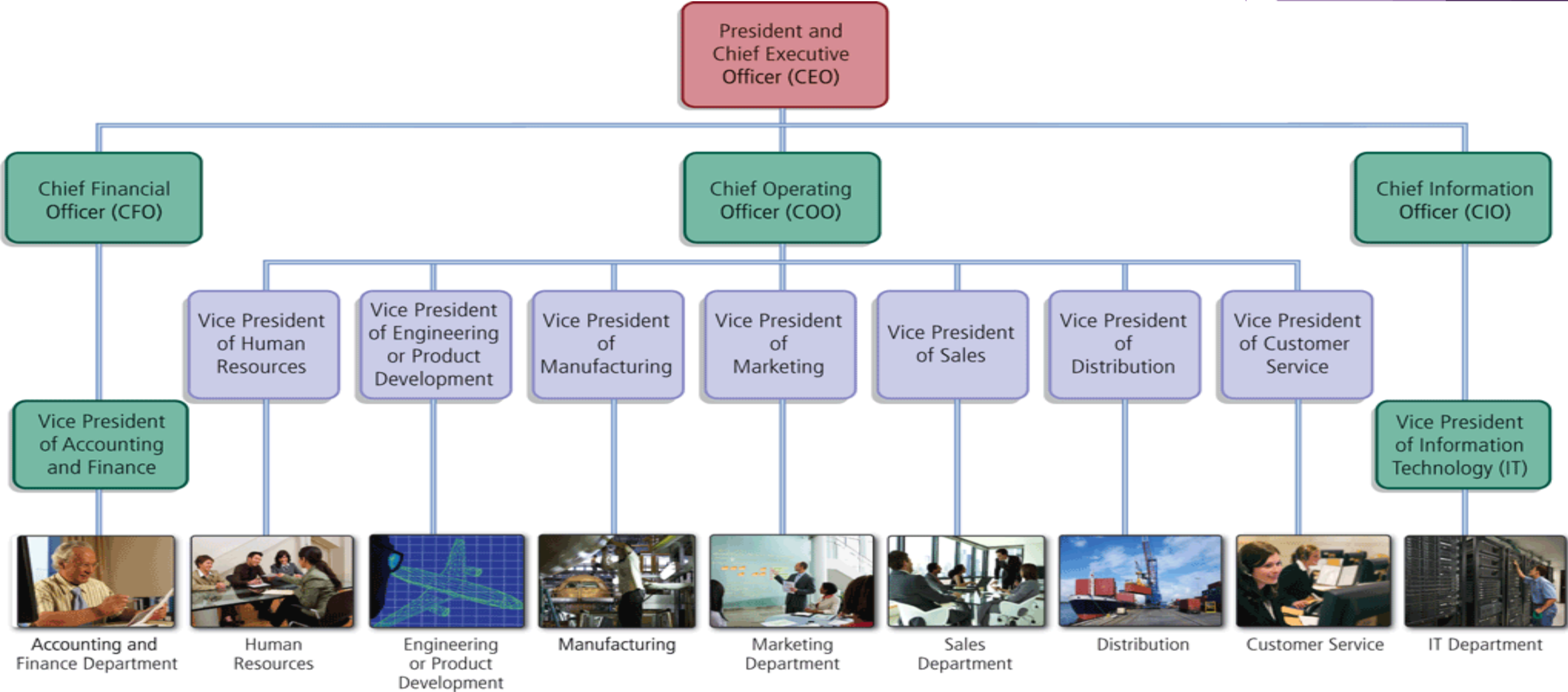
5. *Mobile commerce (m-commerce)*

involves selling goods or services via wireless technology, especially phones

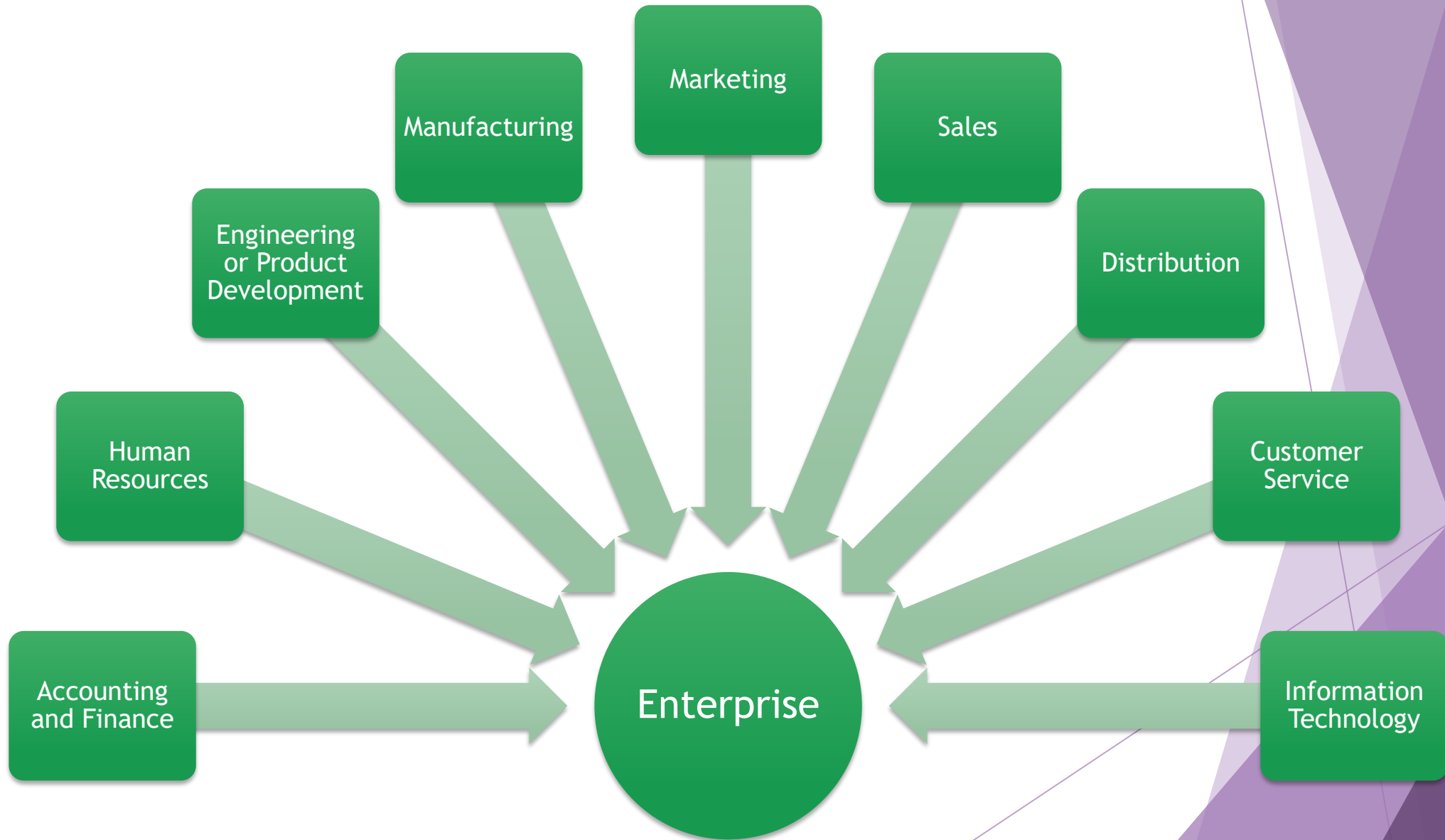
Functional Information Systems

The background features abstract, overlapping geometric shapes in various shades of purple, ranging from light lavender to dark indigo. These shapes are primarily located on the right side of the frame, creating a modern, layered effect.

Hierarchy

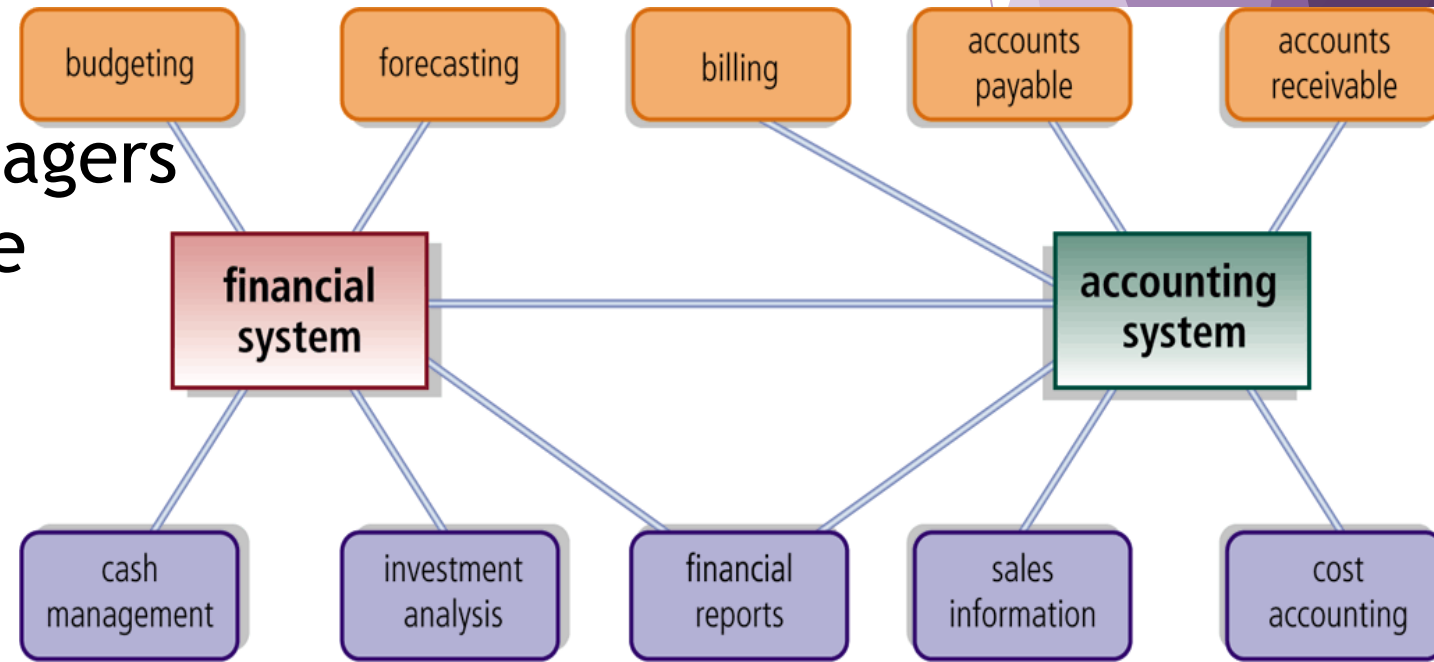


Functional units



Information Systems software

- ▶ **Accounting software** manages everyday transactions
- ▶ **Billing software** helps the company reconcile purchases with customer payments
- ▶ **Financial software** helps managers budget, forecast, and analyze



Human Resources Information Systems (HRIS)

- ▶ manages one or more human resources functions
- ▶ Employee **relationship management systems** manage communication between employees and the business

Optimum Suite - [Break, Joan M. - Personal]

File Edit View Window Tools Help

Employee Select

Company Name	Employee ID	Employee Name	Org Level 3	Email	Termination Date
Optimum Solutions	30	Break, Joan M.	Admin	jbreak@optimum.com	
Optimum Solutions	554	Carter, Tiffany	Quality Assurance	T.Carter@yahoo.com	
Optimum Solutions	555	Davenport, Kristen	Executive	k.davenport@hotmail.com	

Employee Functions

- Employee
- Current Job
- Reports
- Benefits
- Taxes
- Dependent/Beneficiary
- Paid Time Off
- Employment History
- Education History
- Skills
- Attendance
- Property
- Events
- Safety
- Wellness
- Labor Allocation
- Direct Deposit
- Training
- Custom Forms

First Name: Joan
Middle Name: M.
Last Name: Break
Salutation: [v]
Suffix: [v]
Social Security: 412-21-2222
Sex: Female

Ethnic Code: White/Caucasian
Marital Status: Single
Birth Date: 05/02/1975
Age: 35
Graduation Date: [v]
Student:
Date Deceased: [v]
Smoker:

Address

Primary [v] Remove

Line 1: 123 South Street
Line 2: [v]
Line 3: [v]
City: Nashville
State: TN Zip: 37210
Country: USA
County: [v]

Map



New Change Delete Export

Break, Joan...

3.1.10305.1 Administrator administrator SuiteDemo3 2:22 PM

Computer-aided design (CAD)

- ▶ uses a computer and special software to aid in engineering, drafting, and design

Computer-aided engineering (CAE)

- ▶ uses computers to test product designs

Computer-aided / integrated Manufacturing

Computer-aided manufacturing (CAM)

- ▶ is the use of computers to control production equipment

Computer-integrated manufacturing (CIM)

- ▶ uses computers to integrate the many different operations of the manufacturing process

Information Systems

A **quality control system** helps an organization maintain or improve the quality of its products or services

A **marketing information system** serves as a central repository for the tasks of a marketing department

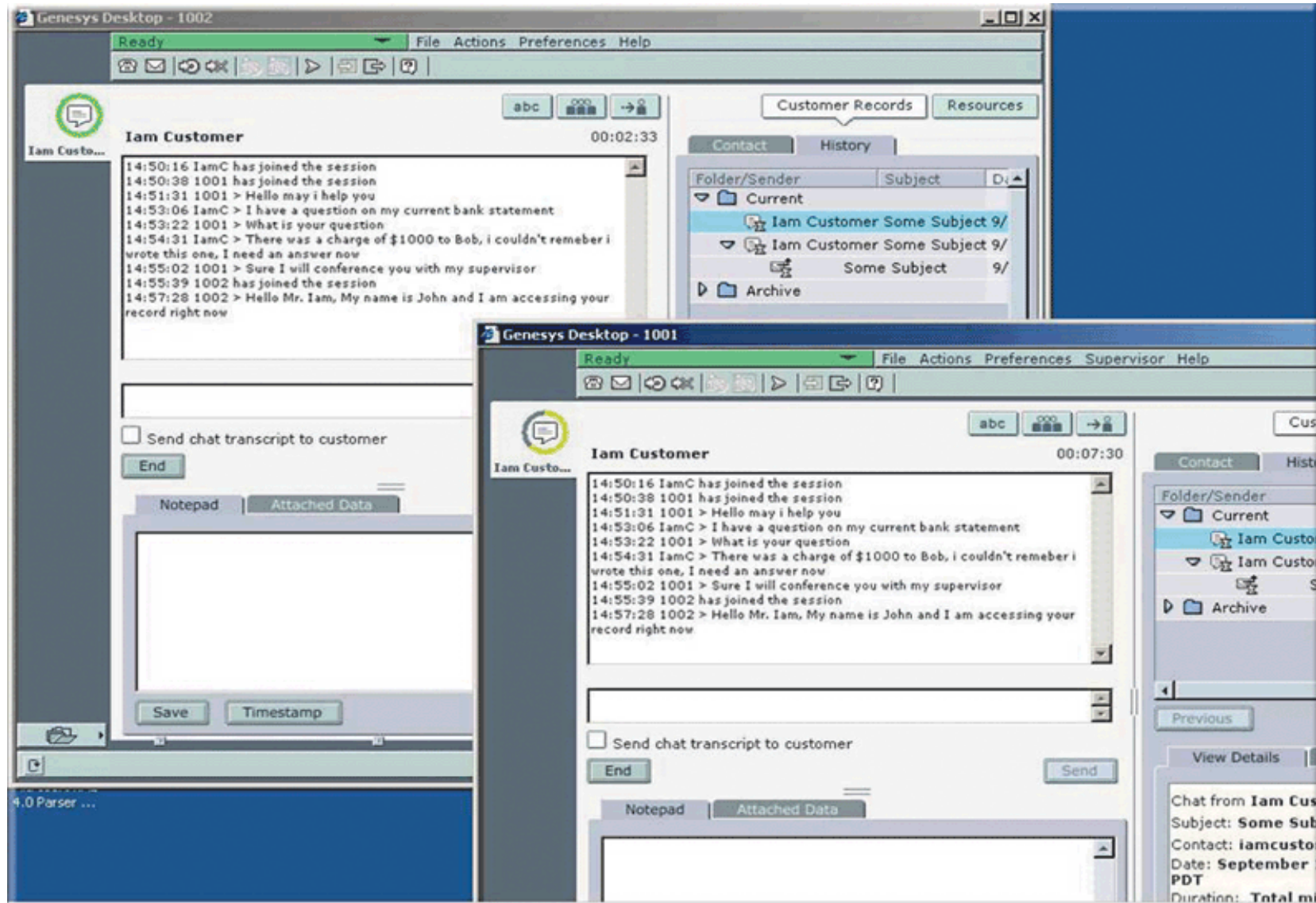
Distribution Information Systems

Provide forecasting
for inventory
control

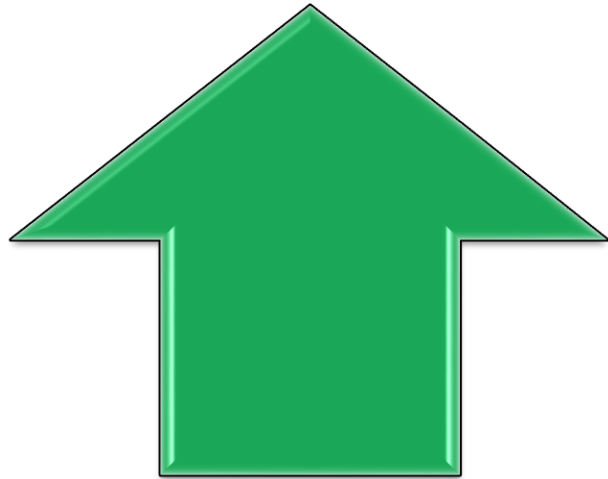
Manage and track
shipping of products

Provide information
and analysis on
inventory in a
warehouse

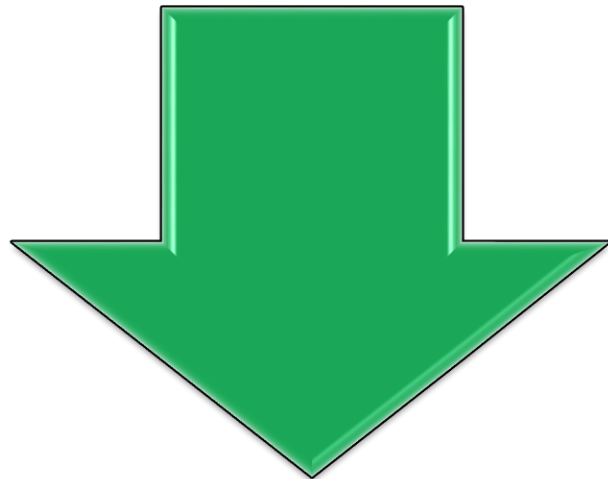
Customer Interaction Information Systems



Information Systems



Material Requirements Planning (MRP) uses software to help monitor and control processes related to production



Manufacturing Resource Planning II (MRP II) is an extension of MRP and also includes software that helps in scheduling

Management Information Systems

The background features a complex, abstract design of overlapping, semi-transparent purple polygons. The colors range from light lavender to deep, dark purple. The shapes are primarily triangles and quadrilaterals, creating a dynamic, layered effect that frames the central text.

Management Information Systems

Features

- ▶ Inputs are processed transaction data.
- ▶ Outputs are summarized structured reports
- ▶ Designed for tactical managers
- ▶ Draws from all departments
- ▶ Produces several kinds or reports: summary, exception, periodic, and demand

Detailed Flight Report for March 30, 2011			
Flight #	Origin/ Destination	Class – Number of Passengers	Premier Club Members
1048	ORD – RSW	A – 5	A – 1
		B – 14	B – 12
		C – 89	C – 20
543	ORD – BMI	A – 2	A – 2
		B – 7	B – 5
		C – 15	C – 5
715	ORD – LAX	A – 12	A – 8
		B – 25	B – 15
		C – 123	C – 39
701	ORD – JFK	A – 9	A – 7
		B – 10	B – 0
		C – 7	C – 3

Figure 14-15b (summary report)

Summary Flight Report for March 30, 2011			
Flight #	Origin/ Destination	Passengers	Premier Club Members
1048	ORD – RSW	108	33
543	ORD – BMI	24	12
715	ORD – LAX	160	62
701	ORD – JFK	26	10

Figure 14-15c (exception report)

Exception Flight Report for March 30, 2011				
Flight #	Class	Origin/ Destination	Premier Club Members	Premier Club Member Goal
1048	A	ORD – RSW	1	4
701	C	ORD – JFK	3	5

Business Intelligence

Business Intelligence IS

Data Warehousing

Data Marts

ETL (Extract, Transform, Load) Processes

Data Integration

Data Governance

Data Quality Management

Data Analytics (Descriptive, Diagnostic, and Predictive)

Business Reporting (KPIs and metrics reporting)

Data Visualization (Dashboards and charting)

Self-Service Analytics

Cloud Data Warehousing

Big Data Management

Real-Time Processing

Performance Optimization

Data Security

Support Systems (MIS)

support systems

1. Decision Support Systems (DSS): Tools that support complex decision-making using data, models, and decision-making frameworks.
2. Executive Information Systems (EIS): Systems providing high-level summaries for executives, often with dashboards.
3. Knowledge Management Systems (KMS): Collecting and managing knowledge within an organization, often used in decision support.
4. Expert Systems: Systems using rules and knowledge bases to provide advice or make decisions.
5. Data Mining and Pattern Recognition: Extracting insights and patterns from large data sets to aid in decision-making.
6. Simulation Models: Allowing users to simulate various scenarios for forecasting outcomes.
7. Optimization and What-If Analysis: Tools for analyzing different business scenarios and outcomes.
8. Predictive Analytics: Using data to forecast trends, often employed in support systems.
9. Geographic Information Systems (GIS): Location-based analytics used in decision-making.
10. Group Decision Support Systems (GDSS): Systems that facilitate collaborative decision-making processes.
11. Robust Reporting and Visualization Tools: For visualizing data in ways tailored to specific decision-making needs.
12. Sensitivity Analysis: Examining how different variables impact outcomes, commonly used in financial and risk analysis.

Management IS (MIS)

Decision support systems (DSS)

- ▶ More complex decisions
 - ▶ Business intelligence (BI) systems
 - ▶ Data mining

Expert Systems

- ▶ Replicate human experts (e.g. knowledge workers)

Executive IS (EIS)

- ▶ Support top managers (executive support systems ESS)
- ▶ Fast access

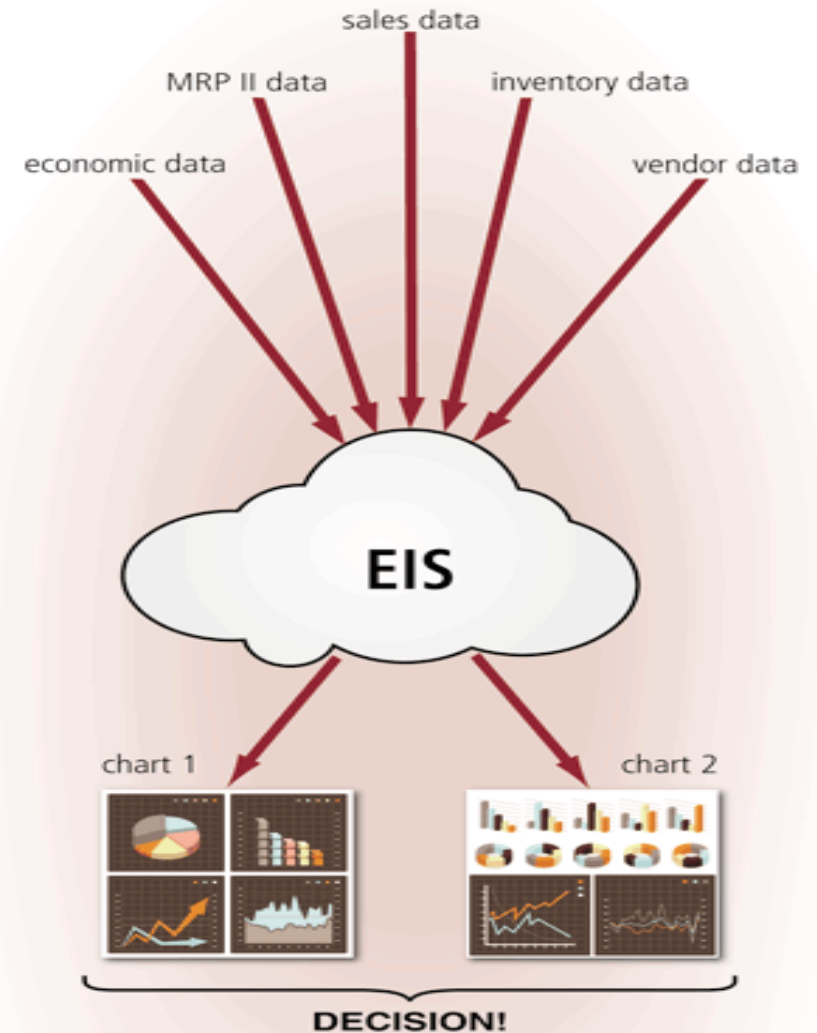
Decision Support Systems

provides a flexible tool for analysis and helps management focus on the future

Features

- ▶ Inputs are external data and internal data such as summarized reports and processed transaction data.
- ▶ Outputs are demand reports
- ▶ Mainly for tactical managers
- ▶ Produces analytic models

Developed to support the types of decisions faced by managers in specific industries

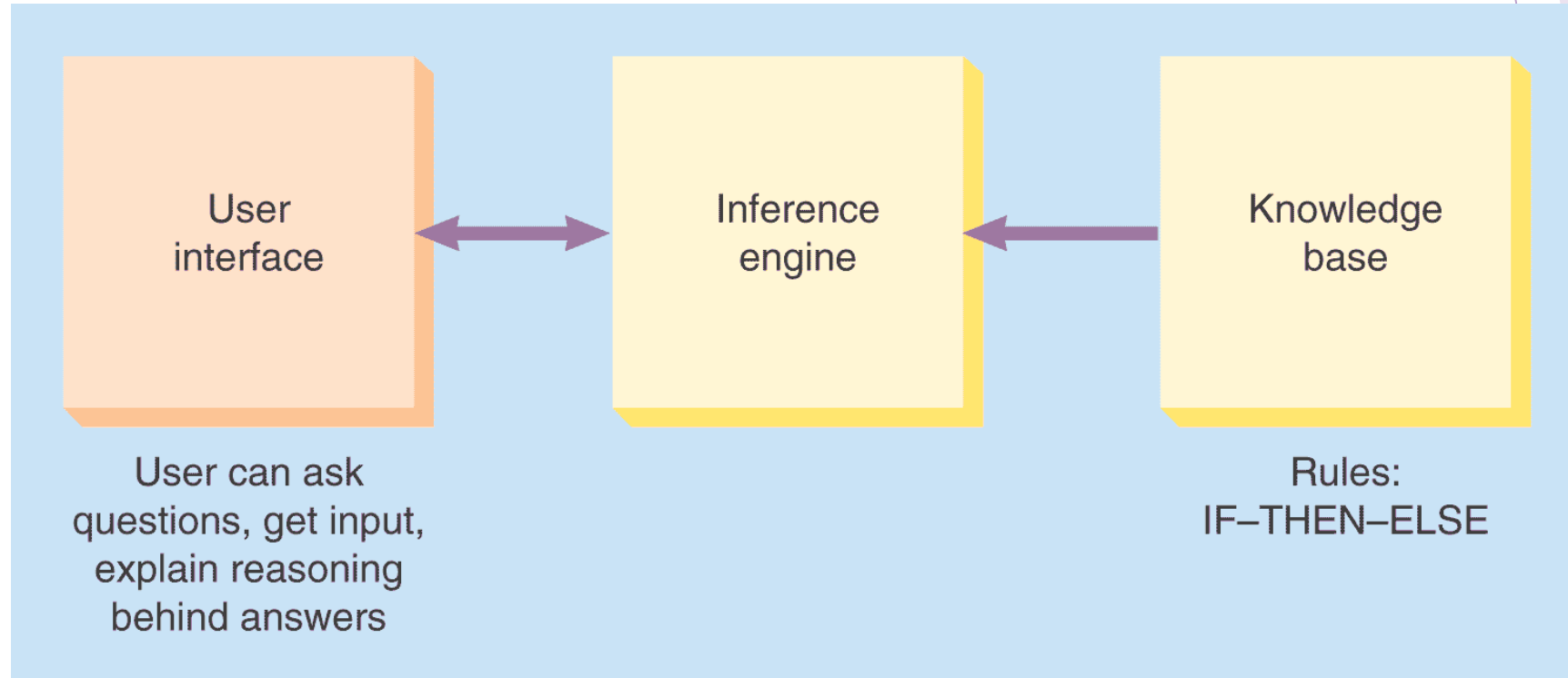


executive in office

Executive Support Systems

- ▶ An easy-to-use DSS made especially for strategic managers to support strategic decision-making
- ▶ Might allow executives to call up predefined reports
- ▶ Includes capability to browse through summarized information on all aspects of the organization and drill down for detailed data
- ▶ Allows executives to perform “what-if” scenarios

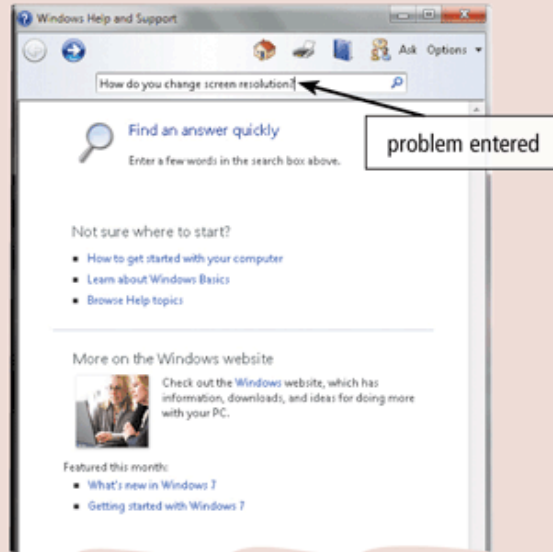
Expert System



Expert System

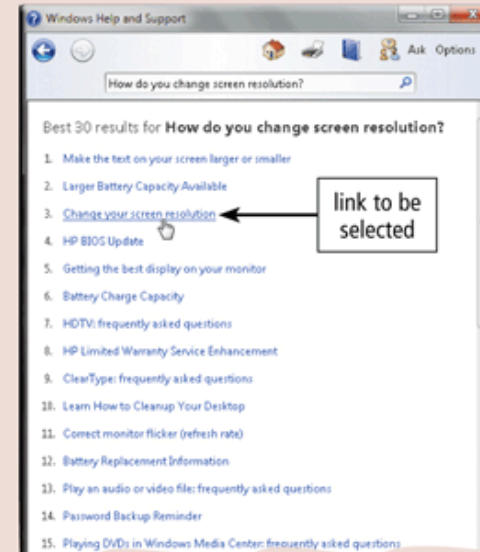
Step 1

A user enters the nature of the problem.



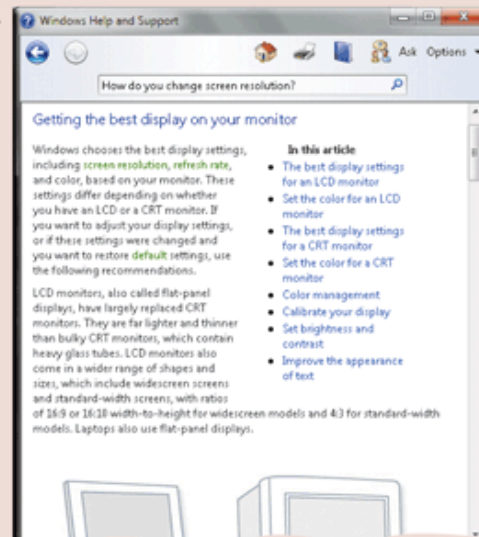
Step 2

Select a suggested solution from the list presented by the expert system.



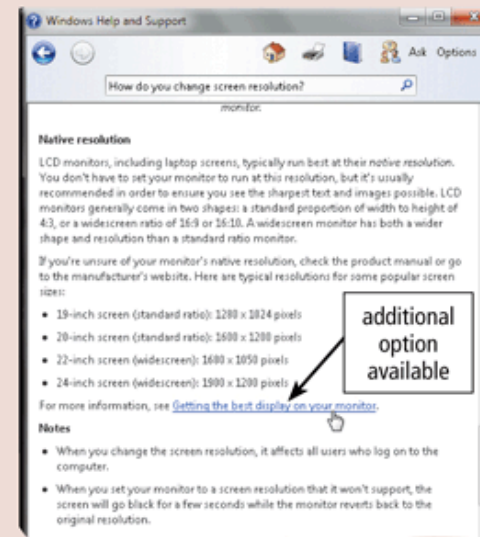
Step 4

Expert system displays detailed steps when requested.



Step 3

Expert system displays details about the solution and additional options.



Enterprise Systems (MIS)

Enterprise IS

Enterprise Resource Planning (ERP) Systems: Integrate core business functions like finance, HR, production, and inventory.

Customer Relationship Management (CRM) Systems: Manage customer interactions and data.

Supply Chain Management (SCM) Systems: Oversee procurement, production, and logistics.

Human Resource Management Systems (HRMS): Manage employee data, payroll, and performance.

Accounting and Financial Systems: Track finances, including accounts payable, receivable, and general ledgers.

Manufacturing Execution Systems (MES): Track and control the production process.

Project Management Systems: Manage and monitor project tasks, timelines, and resources.

Document Management Systems (DMS): Organize and store documents and files for easy retrieval.

Knowledge Management Systems (KMS): Collect and manage organizational knowledge (overlaps with support systems).

Product Lifecycle Management (PLM) Systems: Manage the lifecycle of products from inception to disposal.

Collaboration and Communication Systems: Facilitate communication and collaboration across the organization.

Enterprise Content Management (ECM): Store, organize, and manage all enterprise content, including unstructured data.

Data Warehousing and BI Tools Integration: Integrate with BI systems for enterprise-wide data analytics and insights.

Main Types of Enterprise Systems

enterprise resource planning (ERP)

- ▶ internal production, distribution and financial processes

customer relationship management (CRM)

- ▶ marketing and sales processes

supply chain management (SCM)

- ▶ flow of materials, information and customers through the supply chain

supplier relationship management (SRM)

- ▶ sourcing, purchasing and the warehousing of goods and services.

Other types of ES include:

product lifecycle management (PLM), financial management and human capital management.

Intelligent Information Systems (MIS)

Intelligent IS

1. Artificial Intelligence (AI): Core component, enabling systems to "learn" from data.
2. Machine Learning Models: Algorithms for pattern recognition and prediction.
3. Natural Language Processing (NLP): Understanding and generating human language.
4. Expert Systems: Rule-based systems providing decision support in specific domains.
5. Decision Support Systems (DSS): Interactive systems assisting in decision-making.
6. Knowledge Representation and Reasoning: Systems representing and reasoning through knowledge bases.
7. Robotic Process Automation (RPA): Automating repetitive tasks with "intelligent" software.
8. Intelligent Agents: Autonomous entities that make decisions based on data.
9. Computer Vision: Analyzing and interpreting visual data (e.g., images, videos).
10. Predictive Analytics: Using historical data for forecasting (also overlaps with BI).
11. Recommendation Engines: Systems that provide recommendations based on user data.
12. Cognitive Computing: Systems that mimic human thought processes.
13. Data Mining: Extracting useful information and patterns from large data sets.
14. Fuzzy Logic: Handling uncertainty in reasoning processes.
15. Speech and Image Recognition: Understanding and processing spoken and visual inputs.
16. Automation and Orchestration: Advanced automation, often with AI-driven workflows.



Thank you!
any questions?