



# Chapter 11



## Managing Knowledge



# Management Information Systems

## Chapter 11 Managing Knowledge

### LEARNING OBJECTIVES

- **Assess the role of knowledge management and knowledge management programs in business.**
- **Describe the types of systems used for enterprise-wide knowledge management and demonstrate how they provide value for organizations.**
- **Describe the major types of knowledge work systems and assess how they provide value for firms.**
- **Evaluate the business benefits of using intelligent techniques for knowledge management.**



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## Chapter 11 Managing Knowledge

### Content Management Makes Southern Company a Top Utility Performer

- **Problem:** Document-intensive business, fragmented information in legacy systems and manual processes.
- **Solutions:** Document access rules and procedures reduce the time and cost of business processes by cutting delays in accessing design documents.
- **Documentum content management software and Oracle database** coordinates design documents and maintenance data, and makes them immediately available.
- Demonstrates IT's role in reducing cost by making organizational knowledge more easily available.
- Illustrates how an organization can become more efficient and profitable through content management.



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### The Knowledge Management Landscape

- Sales of enterprise content management software for knowledge management expected to grow 35 percent annually through 2006
- We live in an information economy in which major source of wealth and prosperity is production and distribution of information and knowledge
- About 55 percent of U.S. labor force consists of knowledge and information workers
- 60 percent of U.S. gross domestic product comes from knowledge and information sectors, such as finance and publishing
- Substantial part of a firm's stock market value is related to intangible assets: knowledge, brands, reputations, and unique business processes

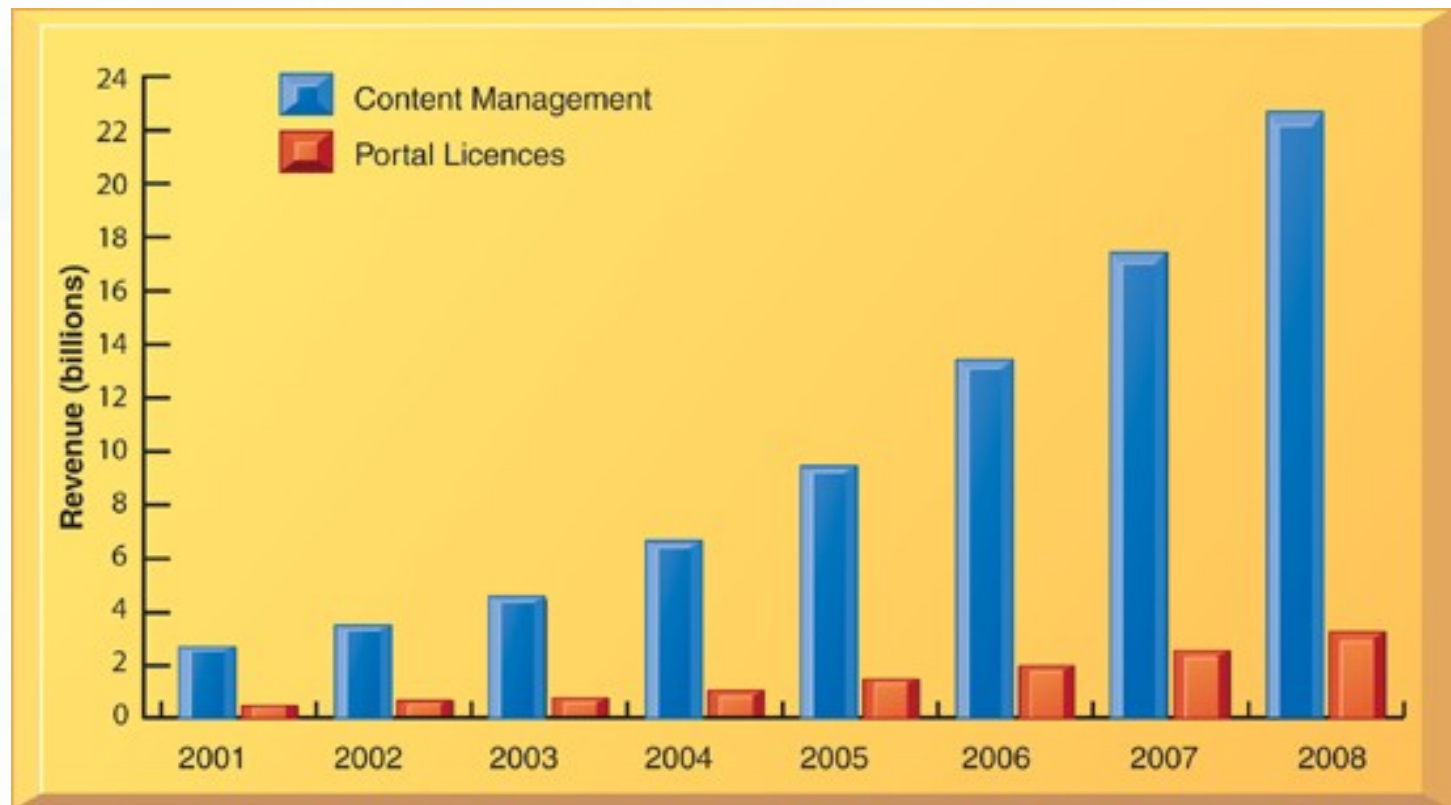


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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

## U.S. Enterprise Knowledge Management Software Revenues, 2001-2008



**Figure 11-1**

Enterprise knowledge management software includes sales of content management and portal licenses, which have been growing at a rate of 35 percent annually, making it among the fastest-growing software applications.





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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- **Important dimensions of knowledge**
  - **Knowledge is a firm asset**
    - Intangible
    - Creation of knowledge from data, information, requires organizational resources
    - As it is shared, experiences network effects
  - **Knowledge has different forms**
    - May be explicit (documented) or tacit (residing in minds)
    - Know-how, craft, skill
    - How to follow procedure
    - Knowing why things happen (causality)



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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- **Important dimensions of knowledge (cont.)**
  - **Knowledge has a location**
    - Cognitive event
    - Both social and individual
    - “Sticky” (hard to move), situated (enmeshed in firm’s culture), contextual (works only in certain situations)
  - **Knowledge is situational**
    - Conditional: Knowing when to apply procedure
    - Contextual: Knowing circumstances to use certain tool



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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- To transform information into knowledge, firm must expend additional resources to discover patterns, rules, and contexts where knowledge works
- **Wisdom:** Collective and individual experience of applying knowledge to solve problems
  - Involves where, when, and how to apply knowledge
- Knowing how to do things effectively and efficiently in ways other organizations cannot duplicate is primary source of profit and competitive advantage that cannot be purchased easily by competitors
  - E.g. Having a unique build-to-order production system





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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- **Organizational learning**
  - Process in which organizations learn
    - Gain experience through collection of data, measurement, trial and error, and feedback
    - Adjust behavior to reflect experience
      - Create new business processes
      - Change patterns of management decision making



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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- **Knowledge management:** Set of business processes developed in an organization to create, store, transfer, and apply knowledge
- **Knowledge management value chain:**
  - Each stage adds value to raw data and information as they are transformed into usable knowledge
  - **Knowledge acquisition**
    - Document tacit and explicit knowledge
    - Creating knowledge
    - Tracking data from TPS and external sources



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### The Knowledge Management Landscape

- **Knowledge management value chain:**
  - **Knowledge storage**
    - Management must:
      - Support development of planned knowledge storage systems
      - Encourage development of corporate-wide schemas for indexing documents
      - Reward employees for taking time to update and store documents properly



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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- **Knowledge management value chain:**
  - **Knowledge dissemination**
    - Training programs, informal networks, and shared management experience help managers focus attention on important knowledge and information
  - **Knowledge application**
    - To provide return on investment, organizational knowledge must become systematic part of management decision making and become situated in decision-support systems

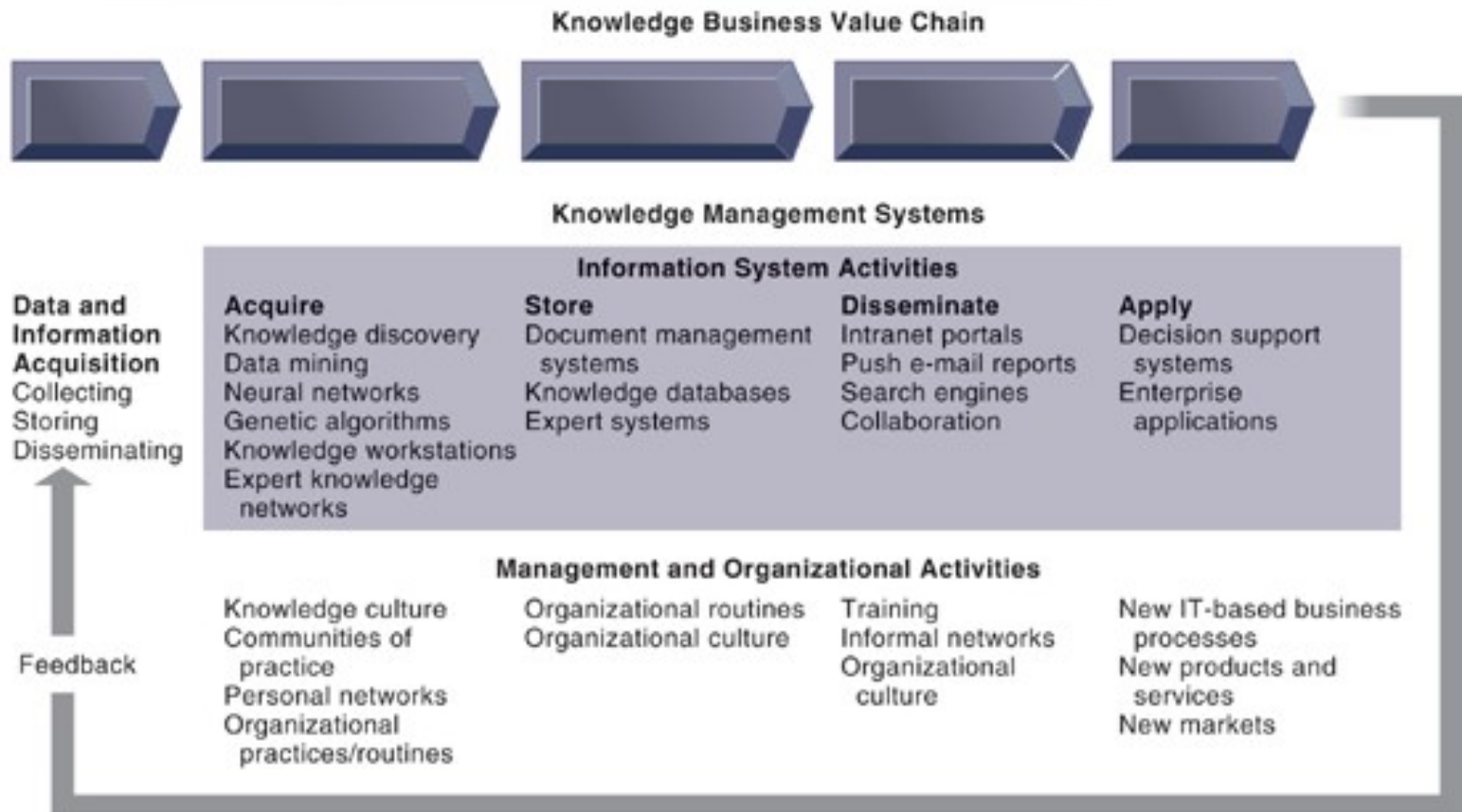


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### The Knowledge Management Landscape

## The Knowledge Management Value Chain



**Figure 11-2**  
Knowledge management today involves both information systems activities and a host of enabling management and organizational activities.





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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- **Organizational roles and responsibilities**
- **Chief knowledge officer (CKO)**
  - Senior executive responsible for firm's knowledge management program
  - Helps design systems to find new sources of knowledge and better utilize existing knowledge
- **Communities of practice (COPs)**
  - Informal social networks of professionals and employees within and outside firm who have similar work-related activities and interests
  - Activities include education, online newsletters, sharing experiences and techniques
  - Facilitate reuse of knowledge, discussion, learning curves of new employees



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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

- **Three major types of knowledge management systems:**
  - **Enterprise-wide knowledge management systems**
    - General-purpose firmwide efforts to collect, store, distribute, and apply digital content and knowledge
  - **Knowledge work systems**
    - Specialized systems built for knowledge workers: employees charged with discovering and creating new knowledge for a company
  - **Intelligent techniques**
    - Diverse group of techniques such as data mining used for various goals: discovering knowledge, distilling knowledge, discovering optimal solutions



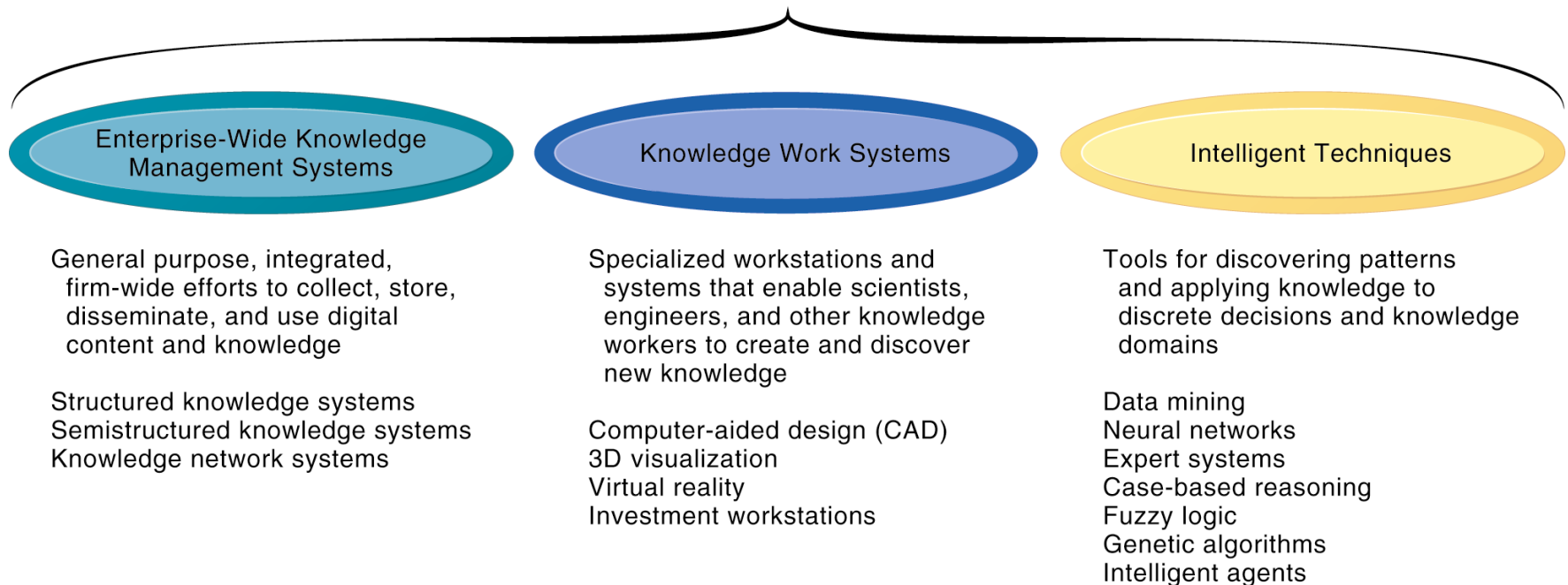
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## Chapter 11 Managing Knowledge

### The Knowledge Management Landscape

## Major Types of Knowledge Management Systems

### Major Types of Knowledge Management Systems



There are three major categories of knowledge management systems, and each can be broken down further into more specialized types of knowledge management systems.

Figure 11-3



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## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Enterprise-wide knowledge management systems**
  - Three major categories of enterprise-wide knowledge management systems for dealing with different kinds of knowledge
    - **Structured knowledge systems**
      - Formal documents
    - **Semistructured knowledge systems**
      - E-mail, voice mail, memos, brochures, digital pictures, bulletin boards, other unstructured documents
    - **Knowledge networks**
      - Network (tacit) knowledge – expertise of individuals

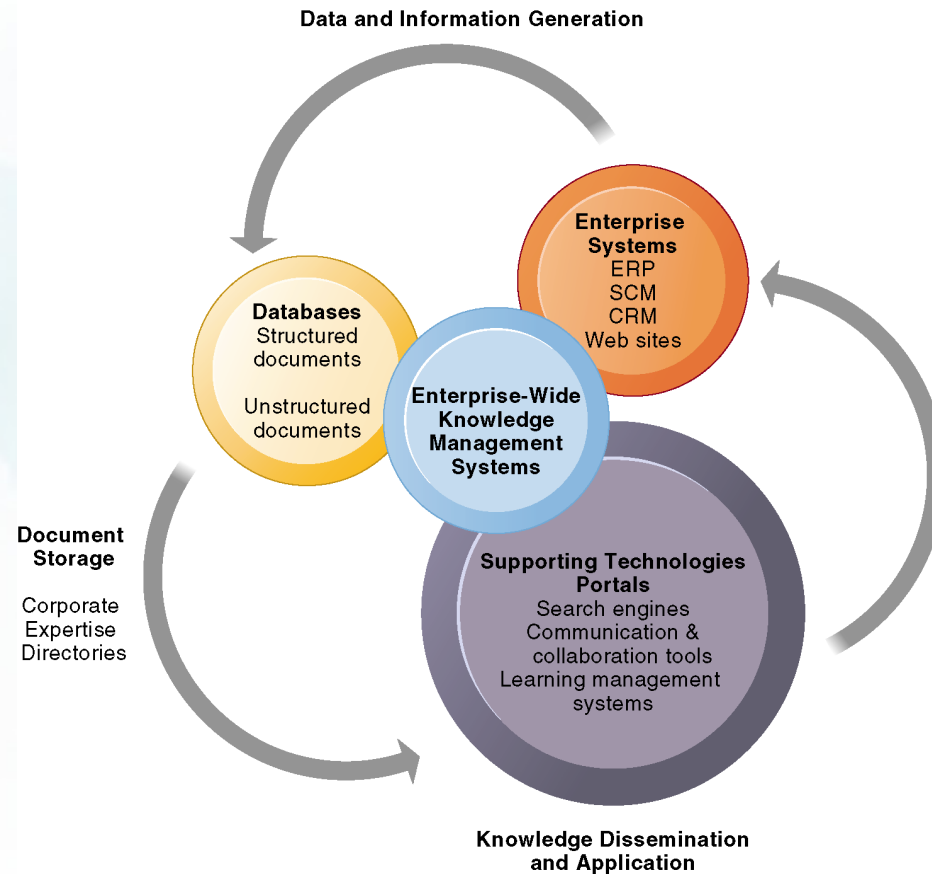


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## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

# Enterprise-Wide Knowledge Management Systems



**Figure 11-4**

Enterprise-wide knowledge management systems use an array of technologies for storing structured and unstructured documents, locating employee expertise, searching for information, disseminating knowledge, and using data from enterprise applications and other key corporate systems.





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## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Essential problem in managing structured knowledge:**
  - Creating classification scheme to use for organizing, tagging, searching for documents
- **Structured knowledge systems:**
  - Implement document tagging
  - Interface with corporate databases storing documents
  - Create enterprise portal environment for searching corporate knowledge



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### Enterprise-Wide Knowledge Management Systems

- Major accounting and consulting firms have structured document and case-based repositories of reports of consultants working with clients
  - Reports placed in database, used to train, prepare new consultants
  - **E.g. KPMG's KWorld**
    - One of world's largest structured knowledge systems
    - Document repository
    - Online collaboration tools
    - Content organized into nine levels by KPMG products and market segments with many subcategories of knowledge

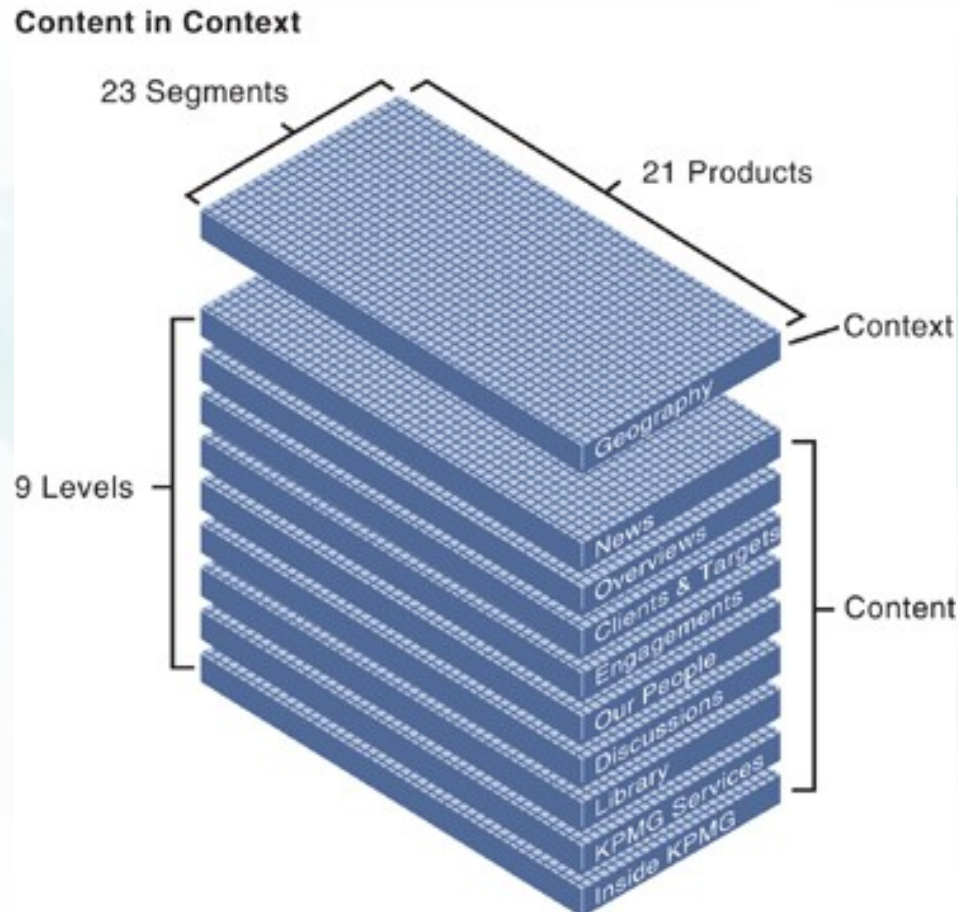


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## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

## K-World's Knowledge Domains



**Figure 11-5**

KPMG's KWorld is organized into nine levels of content that are further classified by product, market segment, and geographic area.



# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Semistructured knowledge:**
  - All the digital information in a firm that does not exist in a formal document or a formal report
    - Messages, memos, proposals, e-mails, graphics, electronic slide presentations, videos
  - Increasingly firms required to manage this content in order to comply with government legislation
  - Sarbanes-Oxley requires some firms to retain digital records of employee e-mail and phone conversations for minimum of five years



# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Semistructured knowledge systems:**
  - Track, store, and organize semistructured documents, as well as more structured traditional documents
  - **E.g. Open Text's LiveLink ECM-eDOCS:**
    - Provides centralized repositories for document management
    - Provides rules-based e-mail management program that profiles incoming and outgoing mail messages using rules developed by line managers



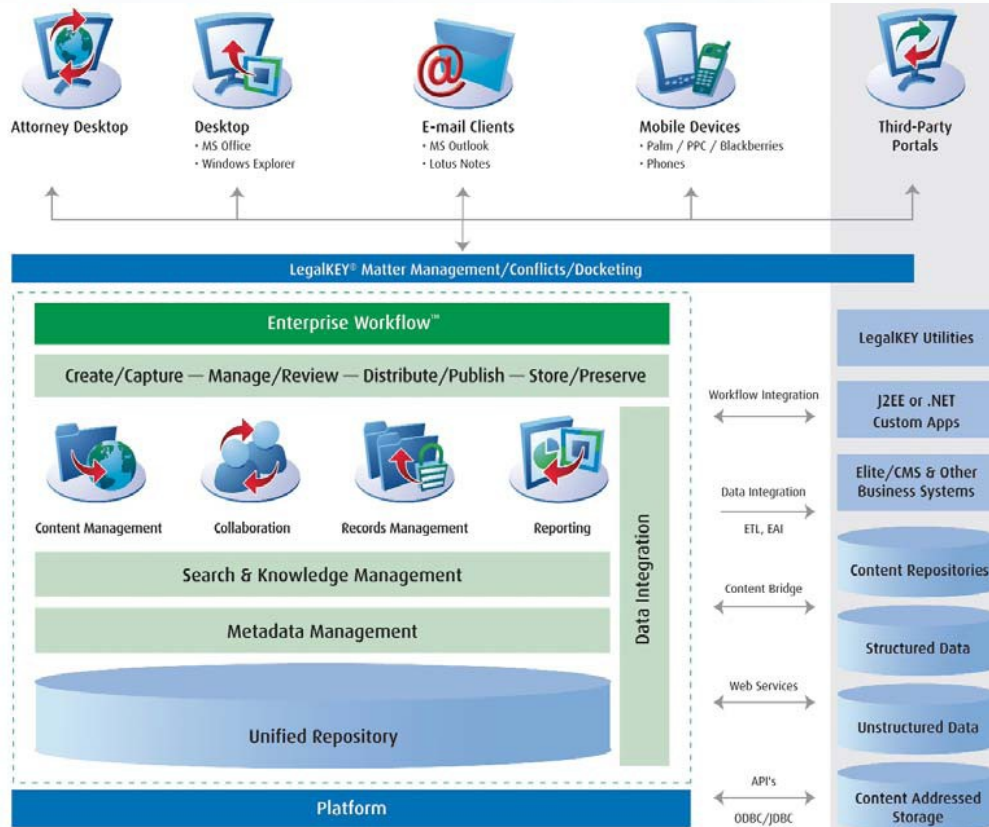


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## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

# LiveLink ECM-eDOCS' Integrated Knowledge Management System



**Figure 11-6**

Open Text's Livelink ECM-eDOCS enterprise solution combines document management, knowledge management, business intelligence, and portal technologies and can be used for managing semistructured as well as structured knowledge.



# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

## Stikeman Elliott Computerizes Its Brainpower

- **Read the Interactive Session: Organizations, and then discuss the following questions:**
  - **What are the problems and challenges that a law firm such as Stikeman Elliott faces?**
  - **What solutions are available to solve these problems?**
  - **How did implementing Hummingbird address these problems? How successful was the solution? Did Stikeman Elliott choose the best alternative?**



# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Organizing knowledge: Taxonomies and tagging**
  - Document repositories require correct classification and taxonomy in order to retrieve documents at later date
  - **Taxonomy:** Scheme for classifying information and knowledge in such a way that it can be easily accessed
  - Once corporate taxonomy is developed, documents can be tagged with proper classification
  - The more precise the taxonomy, the more relevant are search engine results
  - Some products can be used to automate and facilitate classification and tagging
    - Autonomy Taxonomy, SemioTagger



# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Knowledge network systems**
  - Provide online directory of corporate experts in well-defined knowledge domains
  - Use communication technologies to make it easy for employees to find appropriate expert in a company
  - Some systematize solutions developed by experts and store them in knowledge database as best-practices or frequently asked questions (FAQ) repository
  - **AskMe, Inc. software:** Enables companies to develop database of employee expertise and know-how, documents, best practices, and FAQs



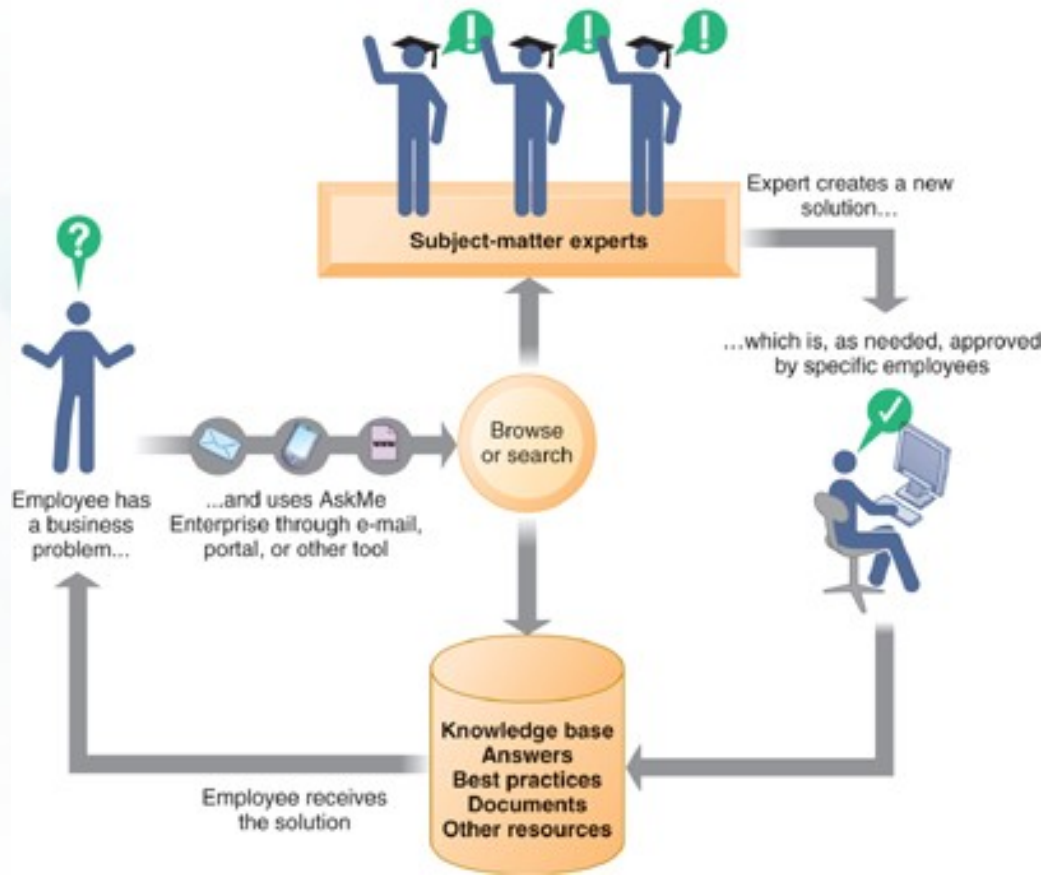
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## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

## AskMe Enterprise Knowledge Network System

AskMe Enterprise Knowledge Network



**Figure 11-7**

A knowledge network maintains a database of firm experts, as well as accepted solutions to known problems. The system facilitates the communication between employees looking for knowledge and internal solution providers, either through the Web-based system, standard e-mail such as Outlook, or instant messaging solutions or handheld devices. Solutions created in this communication are then added to a database of solutions in the form of FAQs, best practices, or other documents.





# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Supporting technologies: Portals, collaboration tools, and learning management systems**
- Major knowledge management system vendors include powerful portal and collaboration technologies:
  - Access to external information, newsfeeds
  - E-mail, chat/IM, discussion groups, videoconferencing
- Companies also using consumer Web technologies for internal use to facilitate exchange of information
  - **Blogs:** Uses include internal opinion gathering, reputation management, consumer intimacy, gathering competitive intelligence



# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

- **Wikis:** Inexpensive way to centralize all kinds of corporate data that can be displayed on Web page
- **Social bookmarking:** Allow users to share bookmarks to Web pages on public Web sites
  - Tags on bookmarks help organize and search for information
- **Learning management systems**
  - Provide tools for management, delivery, tracking, and assessment of various types of employee learning and training
  - Support multiple modes of learning (e.g. CD-ROM, Web-based classes, live instruction, etc.)



# Management Information Systems

## Chapter 11 Managing Knowledge

### Enterprise-Wide Knowledge Management Systems

## Sharing Knowledge with Social Bookmarking

- **Read the Interactive Session: Technology, and then discuss the following questions:**
  - **What are the advantages and disadvantages of using social bookmarking for knowledge management?**
  - **What management, organization, and technology issues should be addressed when considering whether to use social bookmarking for knowledge management at a business?**
  - **Should there be different standards for posting bookmarks to public Web pages at a public Web site and posting bookmarks to internal corporate Web pages on a corporate social bookmarking site?**



# Management Information Systems

## Chapter 11 Managing Knowledge

### Knowledge Work Systems

- **Knowledge work systems**
  - Systems for knowledge workers to help create new knowledge and ensure that knowledge is properly integrated into business
- **Knowledge workers**
  - Researchers, designers, architects, scientists, and engineers who primarily create knowledge and information for the organization
  - Perform three critical roles:
    - Keeping organization current in knowledge
    - Serving as internal consultants regarding their areas of expertise
    - Acting as change agents, evaluating, initiating, and promoting change projects



# Management Information Systems

## Chapter 11 Managing Knowledge

### Knowledge Work Systems

- **Requirements of knowledge work systems**
  - Knowledge workers require highly specialized knowledge work systems
  - Substantial computing power for graphics, complex calculations
  - Powerful graphics, and analytical tools
  - Communications and document management capabilities
  - Access to external databases
  - User-friendly interfaces
  - Optimized for tasks to be performed (design engineering, financial analysis)



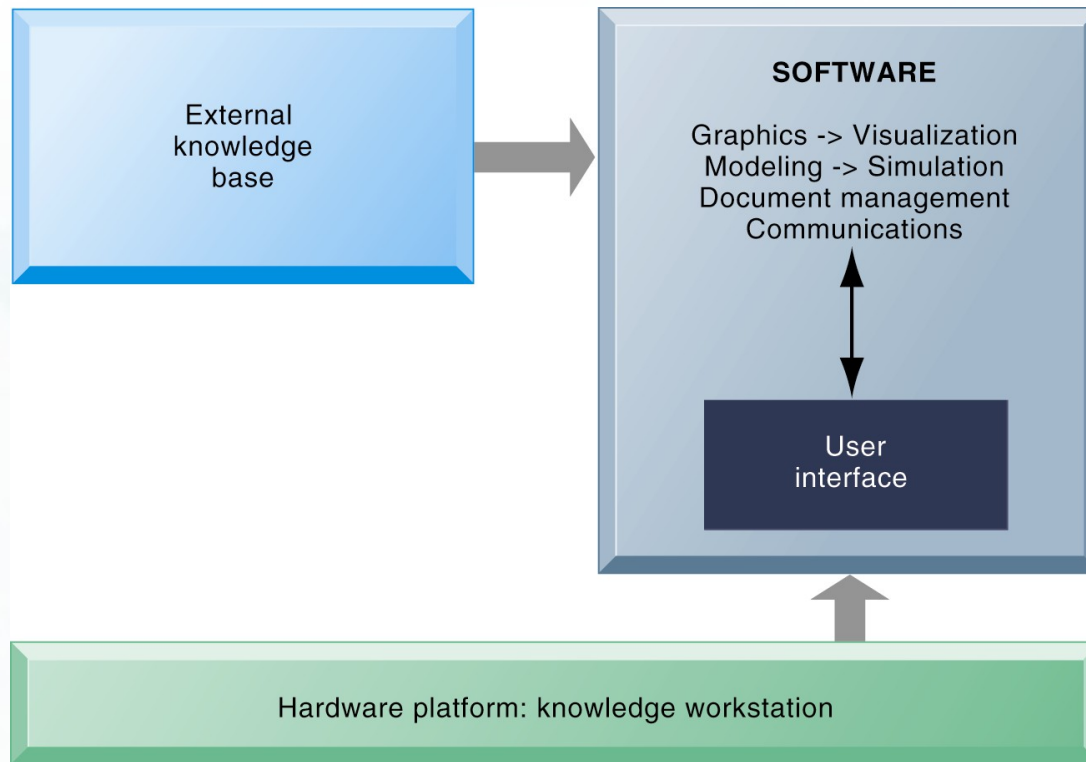


# Management Information Systems

## Chapter 11 Managing Knowledge

### Knowledge Work Systems

## Requirements of Knowledge Work Systems



Knowledge work systems require strong links to external knowledge bases in addition to specialized hardware and software.

Figure 11-8



# Management Information Systems

## Chapter 11 Managing Knowledge

### Knowledge Work Systems

- **Examples of knowledge work systems**
  - **CAD:** Automates creation and revision of engineering or architectural designs, using computers and sophisticated graphics software
  - **Virtual reality systems:** Software and special hardware to simulate real-life environments
    - E.g. 3-D medical modeling for surgeons
  - **VRML (Virtual reality modeling language):** Specifications for interactive, three-dimensional modeling on World Wide Web that can organize multiple media types
  - **Investment workstations:** Streamline investment process and consolidate internal, external data for brokers, traders, portfolio managers



# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Intelligent techniques:** Used to capture individual and collective knowledge and to extend knowledge base
  - **To capture tacit knowledge:** Expert systems, case-based reasoning, fuzzy logic
  - **Knowledge discovery:** Neural networks and data mining
  - **Generating solutions:** Genetic algorithms
  - **Automating tasks:** Intelligent agents
- **Artificial intelligence (AI) technology:**
  - Computer-based systems that emulate human behavior
  - Able to learn languages, accomplish physical tasks, etc.



# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Expert systems:**
  - Capture tacit knowledge in very specific and limited domain of human expertise
  - Capture knowledge of skilled employees in form of set of rules in software system that can be used by others in organization
  - Typically perform limited tasks that may take a few minutes or hours, e.g.:
    - Diagnosing malfunctioning machine
    - Determining whether to grant credit for loan



# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **How expert systems work**
  - **Knowledge base:** Set of hundreds or thousands of rules
  - **Inference engine:** Strategy used to search knowledge base
    - **Forward chaining:** Inference engine begins with information entered by user and searches knowledge base to arrive at conclusion
    - **Backward chaining:** Begins with hypothesis and asks user questions until hypothesis is confirmed or disproved
- **Knowledge engineer:**
  - Systems analyst with expertise in eliciting information and expertise from other professionals who translate knowledge into rules for knowledge base



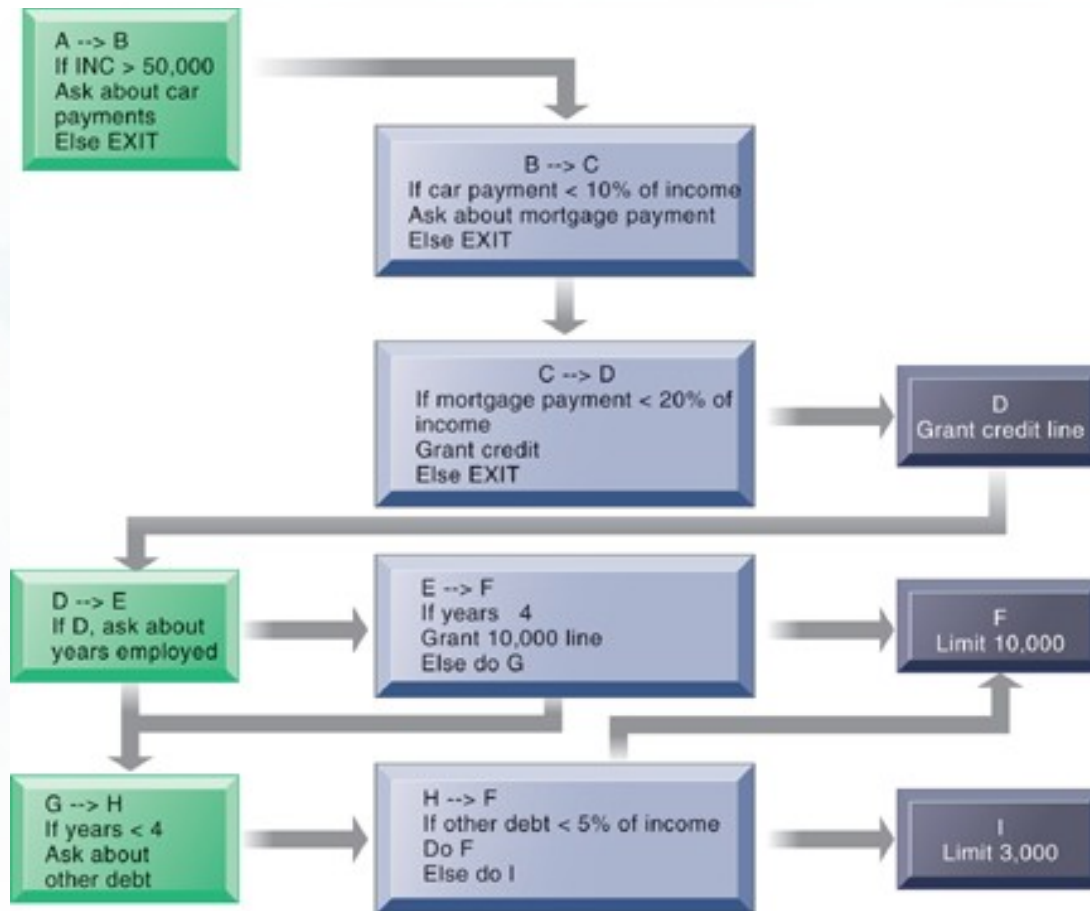


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## Chapter 11 Managing Knowledge

### Intelligent Techniques

## Rules in an Expert System



**Figure 11-9**

An expert system contains a number of rules to be followed. The rules are interconnected; the number of outcomes is known in advance and is limited; there are multiple paths to the same outcome; and the system can consider multiple rules at a single time. The rules illustrated are for simple credit-granting expert systems.

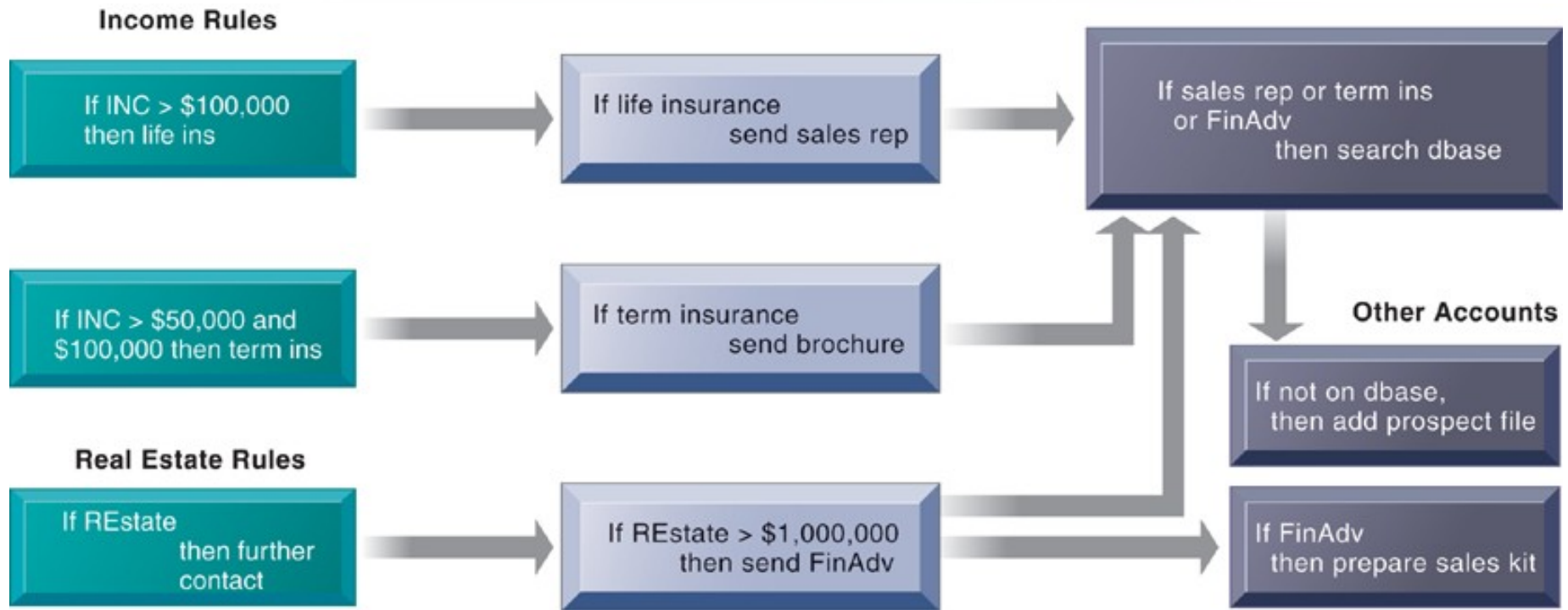


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## Chapter 11 Managing Knowledge

### Intelligent Techniques

## Inference Engines in Expert Systems



An inference engine works by searching through the rules and “firing” those rules that are triggered by facts gathered and entered by the user.

Figure 11-10



# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Successful expert systems**
  - Countrywide Funding Corporation in Pasadena, California, uses expert system to improve decisions about granting loans
  - Con-Way Transportation built expert system to automate and optimize planning of overnight shipment routes for nationwide freight-trucking business
  - Most deal with problems of classification where there are relatively few alternative outcomes and these possible outcomes are all known in advance
- Many expert systems require large, lengthy, and expensive development efforts
- Hiring or training more experts may be less expensive



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## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Case-based reasoning (CBR)**
  - Descriptions of past experiences of human specialists, represented as cases, stored in knowledge base
  - System searches for stored cases with problem characteristics similar to new one, finds closest fit, and applies solutions of old case to new case
  - Successful and unsuccessful applications are grouped with case
  - Stores organizational intelligence: Knowledge base is continuously expanded and refined by users
  - CBR found in
    - Medical diagnostic systems
    - Customer support

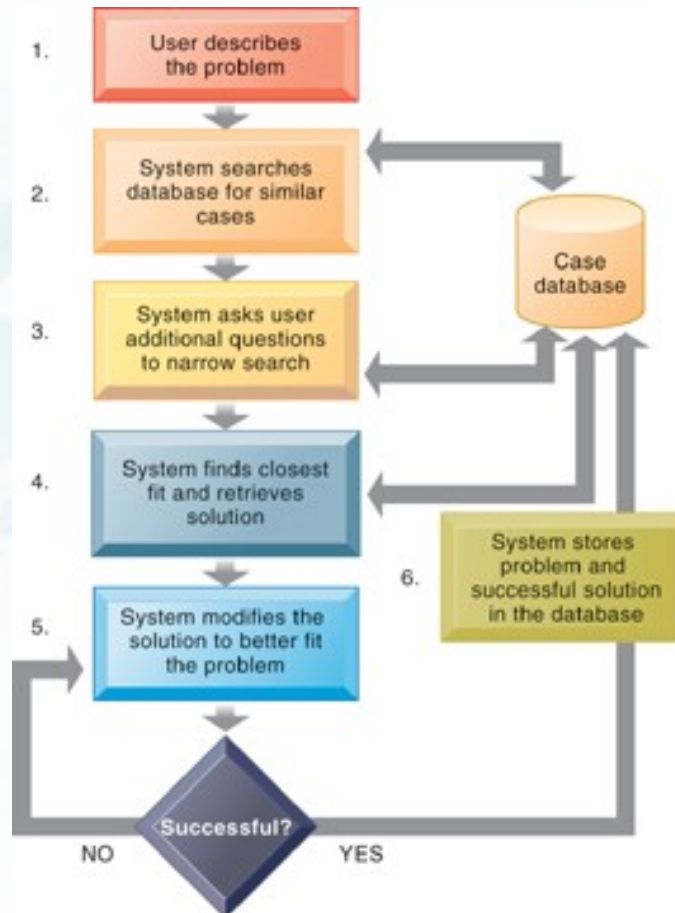


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## Chapter 11 Managing Knowledge

### Intelligent Techniques

## How Case-Based Reasoning Works



**Figure 11-11**

Case-based reasoning represents knowledge as a database of past cases and their solutions. The system uses a six-step process to generate solutions to new problems encountered by the user.





# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Fuzzy logic systems**
  - Rule-based technology that represents imprecision used in linguistic categories (e.g. “cold”, “cool”) that represent range of values
  - Describe a particular phenomenon or process linguistically and then represent that description in a small number of flexible rules
  - Provides solutions to problems requiring expertise that is difficult to represent with crisp IF-THEN rules
    - Autofocus devices in cameras
    - Systems to detect possible medical fraud
    - Sendai’s subway system use of fuzzy logic controls to accelerate smoothly

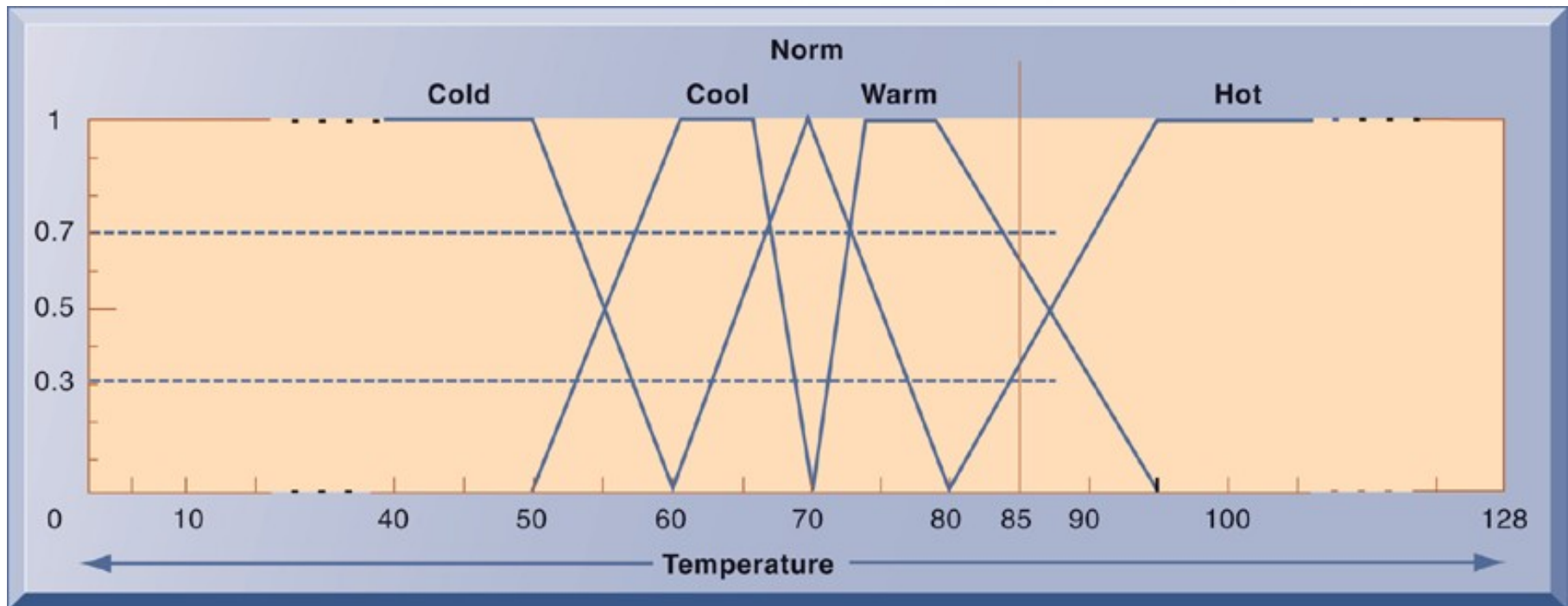


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## Chapter 11 Managing Knowledge

### Intelligent Techniques

## Implementing Fuzzy Logic Rules in Hardware



The membership functions for the input called temperature are in the logic of the thermostat to control the room temperature. Membership functions help translate linguistic expressions such as warm into numbers that the computer can manipulate.

Figure 11-12



# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Neural networks**

- Find patterns and relationships in massive amounts of data that are too complicated for human to analyze
- “Learn” patterns by searching for relationships, building models, and correcting over and over again model’s own mistakes
- Humans “train” network by feeding it training data for which inputs produce known set of outputs or conclusions, to help neural network learn correct solution by example
- Neural network applications in medicine, science, and business address problems in pattern classification, prediction, financial analysis, and control and optimization

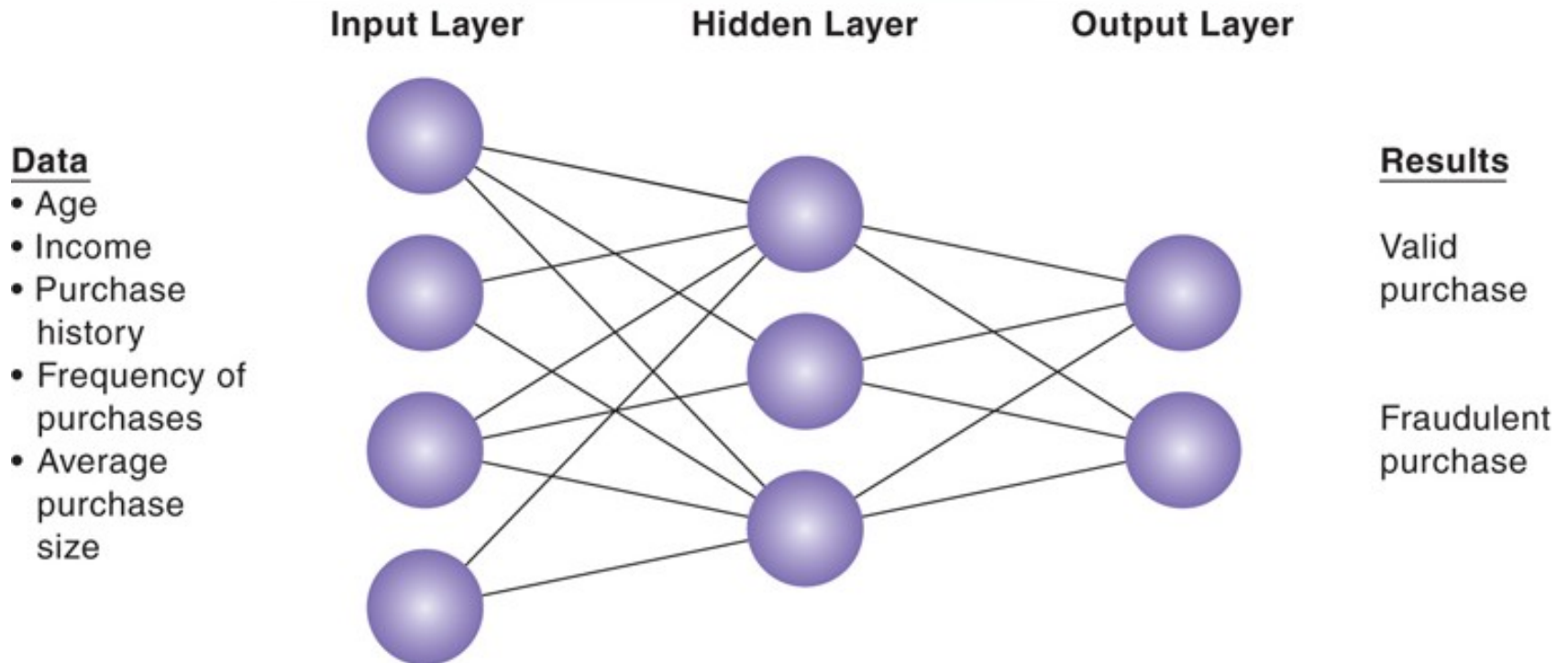


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## Chapter 11 Managing Knowledge

### Intelligent Techniques

## How a Neural Network Works



A neural network uses rules it “learns” from patterns in data to construct a hidden layer of logic. The hidden layer then processes inputs, classifying them based on the experience of the model. In this example, the neural network has been trained to distinguish between valid and fraudulent credit card purchases.

**Figure 11-13**



# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Genetic algorithms**
  - Useful for finding optimal solution for specific problem by examining very large number of possible solutions for that problem
  - Conceptually based on process of evolution
    - Search among solution variables by changing and reorganizing component parts using processes such as reproduction, mutation, and natural selection
  - Used in optimization of business problems (minimization of costs, efficient scheduling, etc.) in which hundreds or thousands of variables exist



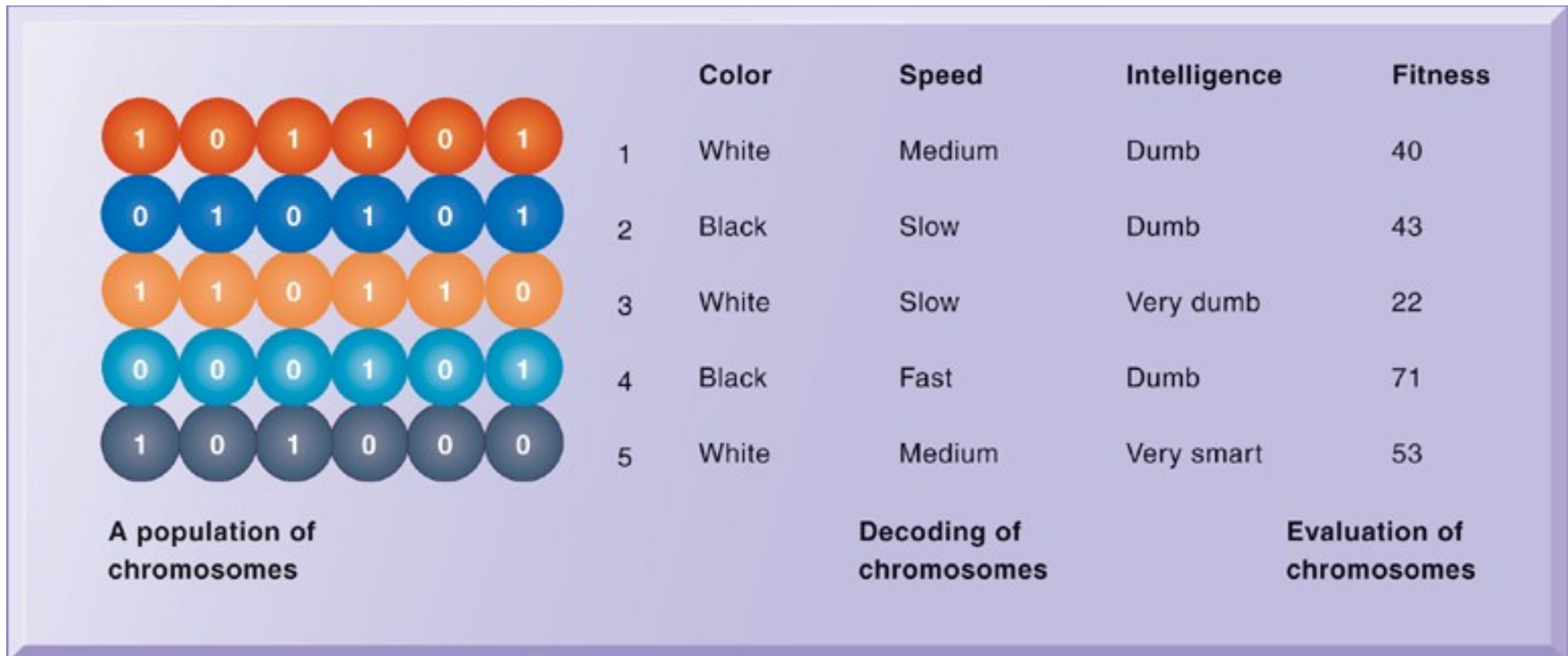


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### Intelligent Techniques

## The Components of a Genetic Algorithm



This example illustrates an initial population of “chromosomes,” each representing a different solution. The genetic algorithm uses an iterative process to refine the initial solutions so that the better ones, those with the higher fitness, are more likely to emerge as the best solution.

Figure 11-14



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## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Hybrid AI systems**
  - Genetic algorithms, fuzzy logic, neural networks, and expert systems integrated into single application to take advantage of best features of each
  - E.g. Matsushita “neurofuzzy” washing machine that combines fuzzy logic with neural networks



# Management Information Systems

## Chapter 11 Managing Knowledge

### Intelligent Techniques

- **Intelligent agents**

- Work in background to carry out specific, repetitive, and predictable tasks for individual user, business process, or software application
- Use limited built-in or learned knowledge base to accomplish tasks or make decisions on user's behalf
- E.g. Deleting junk e-mail, finding cheapest airfare, Microsoft Office software wizards
- **Agent-based modeling** applications: Model behavior of consumers, stock markets, and supply chains and to predict spread of epidemics
  - Procter & Gamble used agent-based modeling to improve coordination among supply-chain members

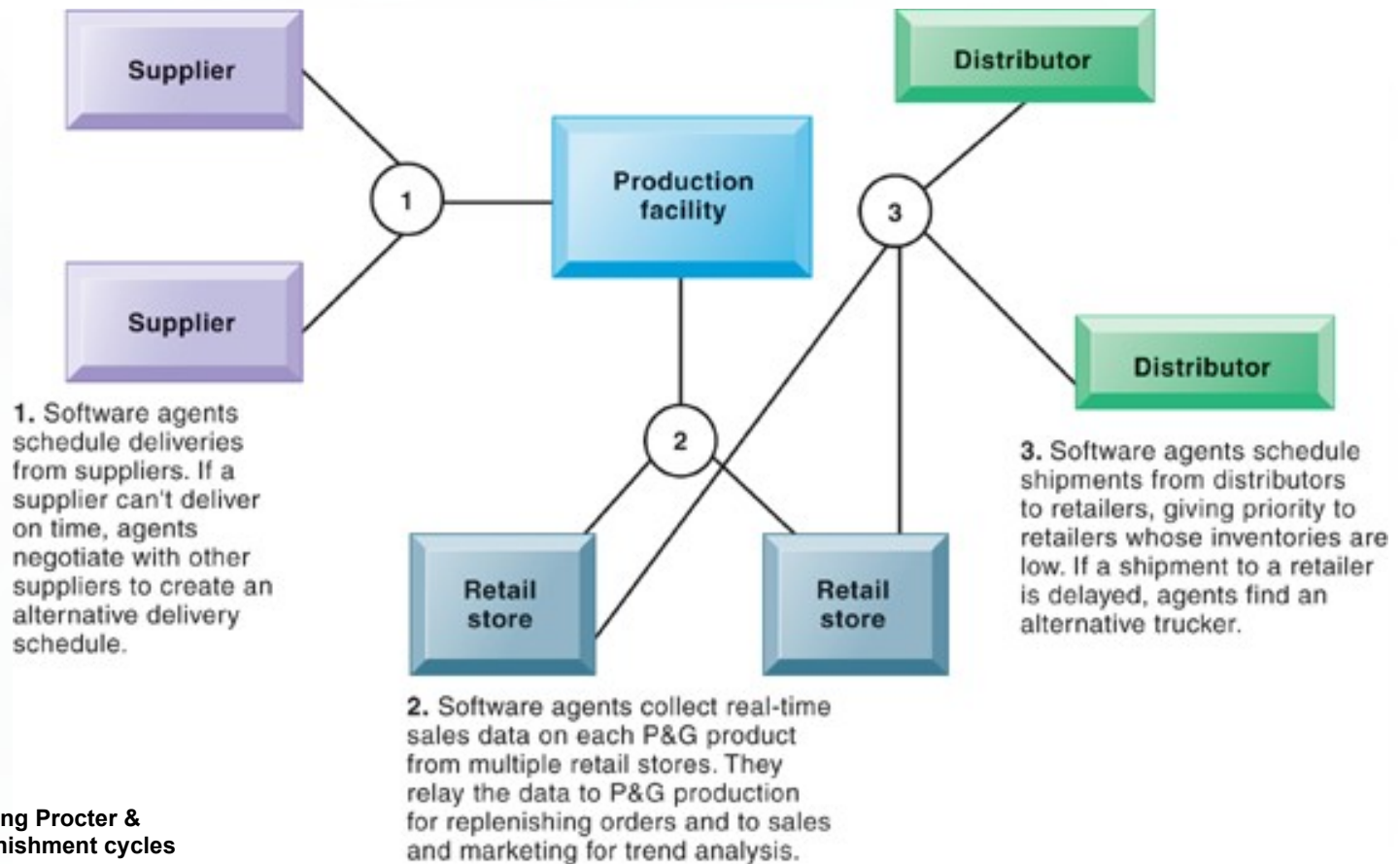


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## Chapter 11 Managing Knowledge

### Intelligent Techniques

## Intelligent Agents in P&G's Supply Chain Network



**Figure 11-15**

Intelligent agents are helping Procter & Gamble shorten the replenishment cycles for products such as a box of Tide.