10

MANAGING KNOWLEDGE

Learning Objectives

- **Apa peran program manajemen pengetahuan dan manajemen pengetahuan dalam bisnis?**

- **Apa jenis sistem yang digunakan untuk manajemen pengetahuan seluruh perusahaan dan bagaimana mereka memberikan nilai bagi bisnis?**

- **Apa saja jenis utama dari sistem kerja pengetahuan dan bagaimana mereka memberikan nilai bagi perusahaan?**

- **Apa manfaat bisnis menggunakan teknik cerdas untuk manajemen pengetahuan?**

P&G Moves from Paper to Pixels for Knowledge Management

- **Problem:** Penelitian Dokumen-intensif dan bergantung pada kertas catatan perkembangan

- **Solutions:** Manajemen dokumen menyimpan informasi sistem penelitian elektronik digital

- **eLab Notebook documentum management software** menciptakan PDF, memungkinkan tanda tangan digital, embeds hak penggunaan, memungkinkan pencarian digital perpustakaan

- Menunjukkan TI berperan dalam mengurangi biaya dengan membuat pengetahuan organisasi lebih mudah tersedia

- Menggambarkan bagaimana suatu organisasi dapat menjadi lebih efisien dan menguntungkan melalui content management

Pemandangan Manajemen Pengetahuan

- **Sistem manajemen pengetahuan antar wilayah yang paling cepat berkembang dari investasi perangkat lunak**

- **Information economy**
  - 55% angkatan kerja AS: pengetahuan dan informasi pekerja
  - 60% Gross domestic product -GDP AS dari sektor pengetahuan dan informasi

- **Substansial bagian dari nilai pasar saham perusahaan terkait dengan aset tidak berwujud: pengetahuan, merek, reputasi, dan proses bisnis yang unik**

- **Proyek berbasis pengetahuan dilaksanakan dengan baik dapat menghasilkan ROI yang luar biasa**

- **Dimensi penting dari pengetahuan**
  - **Pengetahuan adalah aset perusahaan**
    - intangible
    - Penciptaan pengetahuan dari data, informasi, membutuhkan sumber daya organisasi
    - Seperti hal itu dibagikan, mengalami efek jaringan
  - **Pengetahuan memiliki bentuk yang berbeda**
    - Mungkin eksplisit (didokumentasikan) atau tacit (berada dalam pikiran)
    - Tahu-bagaimana, kerajinan, keterampilan
    - Cara mengikuti prosedur
    - Mengetahui mengapa sesuatu terjadi (kausalitas)

- **Dimensi penting dari pengetahuan (cont.)**

  – **Pengetahuan memiliki lokasi**
    - acara kognitif
    - Baik sosial dan individu
    - "Sticky" (sulit untuk bergerak), terletak (terjerat dalam budaya perusahaan), kontekstual (bekerja hanya dalam situasi tertentu)

  – **Pengetahuan adalah situasional**
    - Conditional: Mengetahui kapan harus menerapkan prosedur
    - Kontekstual: Mengetahui keadaan untuk menggunakan alat tertentu

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 others cannot duplicate is prime source of profit and competitive advantage**
  - E.g., Having a unique build-to-order production system

- **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

- **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**

  1. **Knowledge acquisition**
  2. **Knowledge storage**
  3. **Knowledge dissemination**
  4. **Knowledge application**

- **Knowledge management value chain**
  1. **Knowledge acquisition**
     - Documenting tacit and explicit knowledge
       – Storing documents, reports, presentations, best practices
       – Unstructured documents (e.g., e-mails)
       – Developing online expert networks
     - Creating knowledge
     - Tracking data from TPS and external sources

- **Knowledge management value chain (cont.)**
  2. **Knowledge storage**
     - Databases
     - Document management systems
     - Role of management:
       - 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

- **Knowledge management value chain (cont.)**
  3. **Knowledge dissemination**
     - Portals
     - Push e-mail reports
     - Search engines
     - Collaboration tools
     - A deluge of information?
       - Training programs, informal networks, and shared management experience help managers focus attention on important information
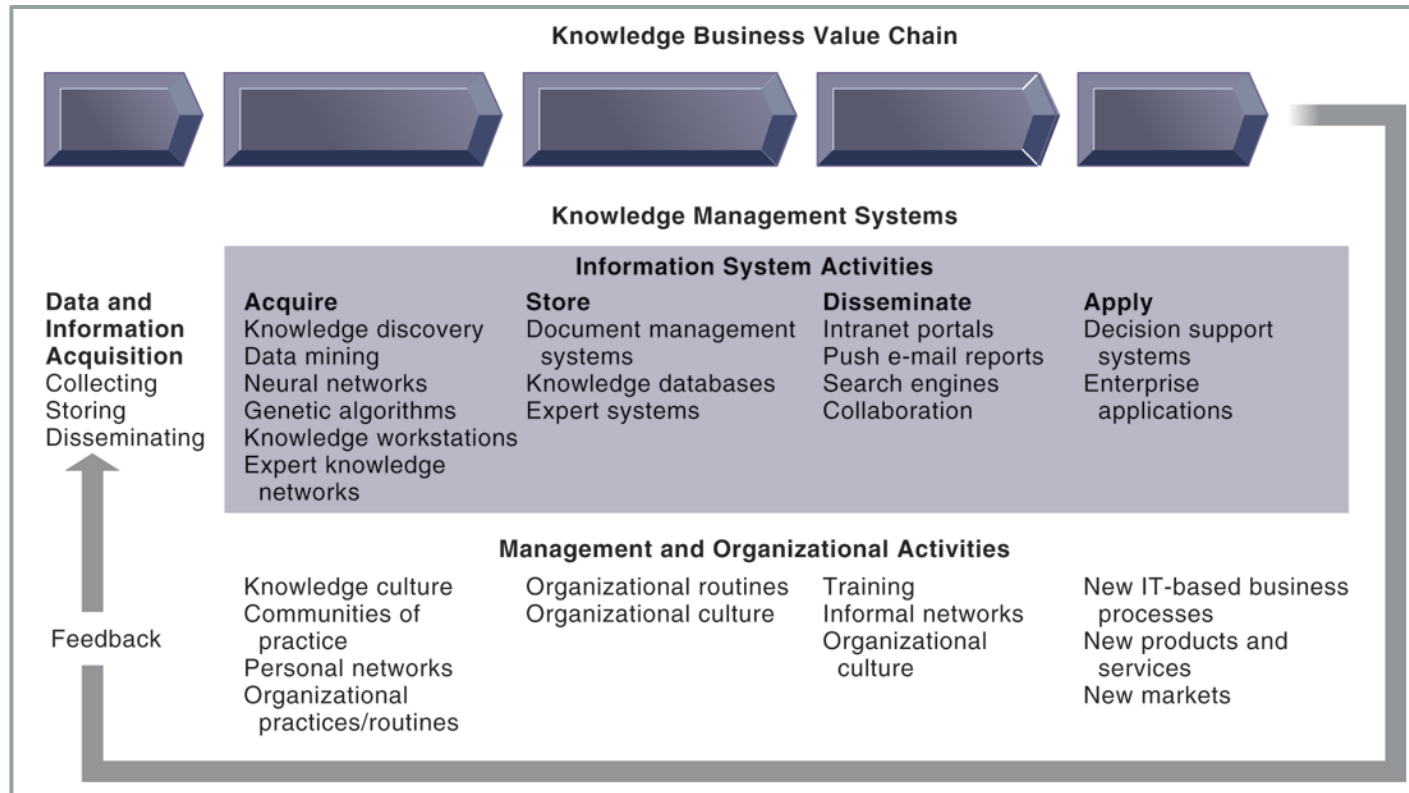
- **Knowledge management value chain (cont.)**

  4. Knowledge application
     - To provide return on investment, organizational knowledge must become systematic part of management decision making and become situated in decision-support systems.
       – New business practices
       – New products and services
       – New markets

The Knowledge Management Landscape

THE KNOWLEDGE MANAGEMENT VALUE CHAIN

Knowledge Business Value Chain

Knowledge Management Systems

Information System Activities

Data and Information Acquisition	Acquire	Store	Disseminate	Apply
Collecting Storing Disseminating	Knowledge discovery Data mining Neural networks Genetic algorithms Knowledge workstations Expert knowledge networks	Document management systems Knowledge databases Expert systems	Intranet portals Push e-mail reports Search engines Collaboration	Decision support systems Enterprise applications

Management and Organizational Activities

Feedback	Knowledge culture Communities of practice Personal networks Organizational practices/routines	Organizational routines Organizational culture	Training Informal networks Organizational culture	New IT-based business processes New products and services New markets

Knowledge management today involves both information systems activities and a host of enabling management and organizational activities.
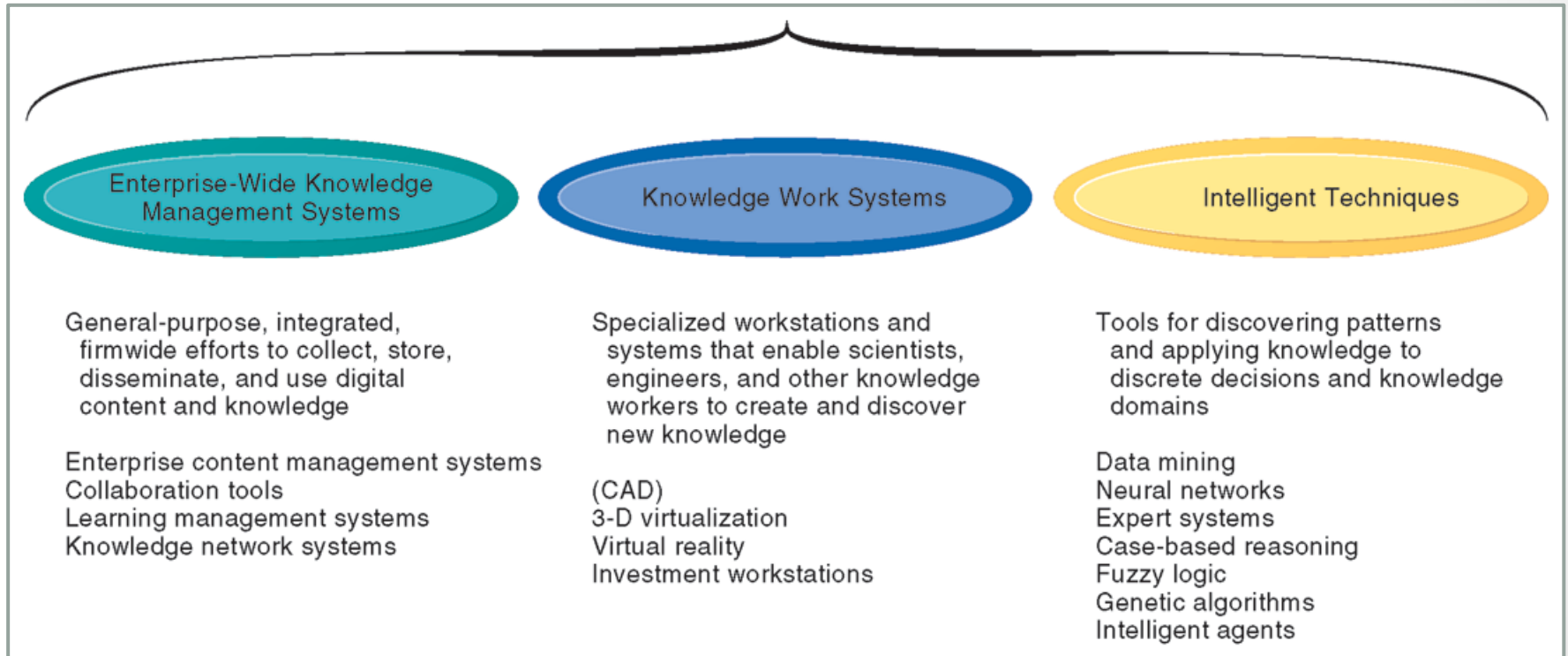
The Knowledge Management Landscape

- **New organizational roles and responsibilities**
  - **Chief knowledge officer executives**
  - **Dedicated staff / knowledge managers**
  - **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
    - Reduce learning curves of new employees

The Knowledge Management Landscape

- **3 major types of knowledge management systems:**
  1. **Enterprise-wide knowledge management systems**
     - General-purpose firm-wide efforts to collect, store, distribute, and apply digital content and knowledge
  2. **Knowledge work systems (KWS)**
     - Specialized systems built for engineers, scientists, other knowledge workers charged with discovering and creating new knowledge
  3. **Intelligent techniques**
     - Diverse group of techniques such as data mining used for various goals: discovering knowledge, distilling knowledge, discovering optimal solutions

The Knowledge Management Landscape

MAJOR TYPES OF KNOWLEDGE MANAGEMENT SYSTEMS

Enterprise-Wide Knowledge Management Systems

General-purpose, integrated, firmwide efforts to collect, store, disseminate, and use digital content and knowledge

Enterprise content management systems
Collaboration tools
Learning management systems
Knowledge network systems

Knowledge Work Systems

Specialized workstations and systems that enable scientists, engineers, and other knowledge workers to create and discover new knowledge

(CAD)
3-D virtualization
Virtual reality
Investment workstations

Intelligent Techniques

Tools for discovering patterns and applying knowledge to discrete decisions and knowledge domains

Data mining
Neural networks
Expert systems
Case-based reasoning
Fuzzy logic
Genetic algorithms
Intelligent agents

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

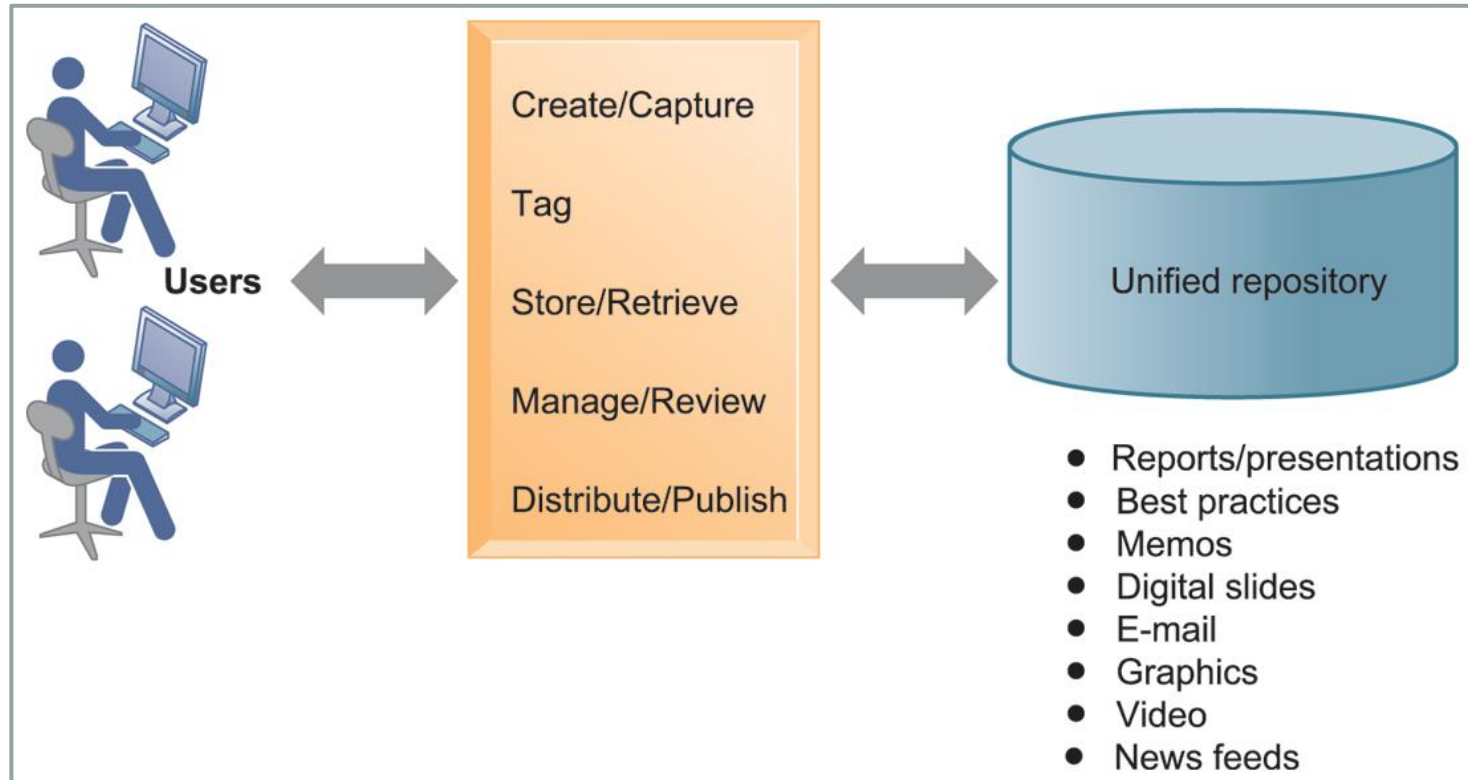## Enterprise-Wide Knowledge Management Systems

- **Three major types of knowledge in enterprise**

  1. **Structured documents**
     - Reports, presentations
     - Formal rules

  2. **Semistructured documents**
     - E-mails, videos

  3. **Unstructured, tacit knowledge**

- **80% of an organization's business content is semistructured or unstructured**

Enterprise-Wide Knowledge Management Systems

- **Enterprise content management systems**
  - **Help capture, store, retrieve, distribute, preserve**
    - Documents, reports, best practices
    - Semistructured knowledge (e-mails)
  - **Bring in external sources**
    - News feeds, research
  - **Tools for communication and collaboration**

Enterprise-Wide Knowledge Management Systems

AN ENTERPRISE CONTENT MANAGEMENT SYSTEM

An enterprise content management system has capabilities for classifying, organizing, and managing structured and semistructured knowledge and making it available throughout the enterprise.
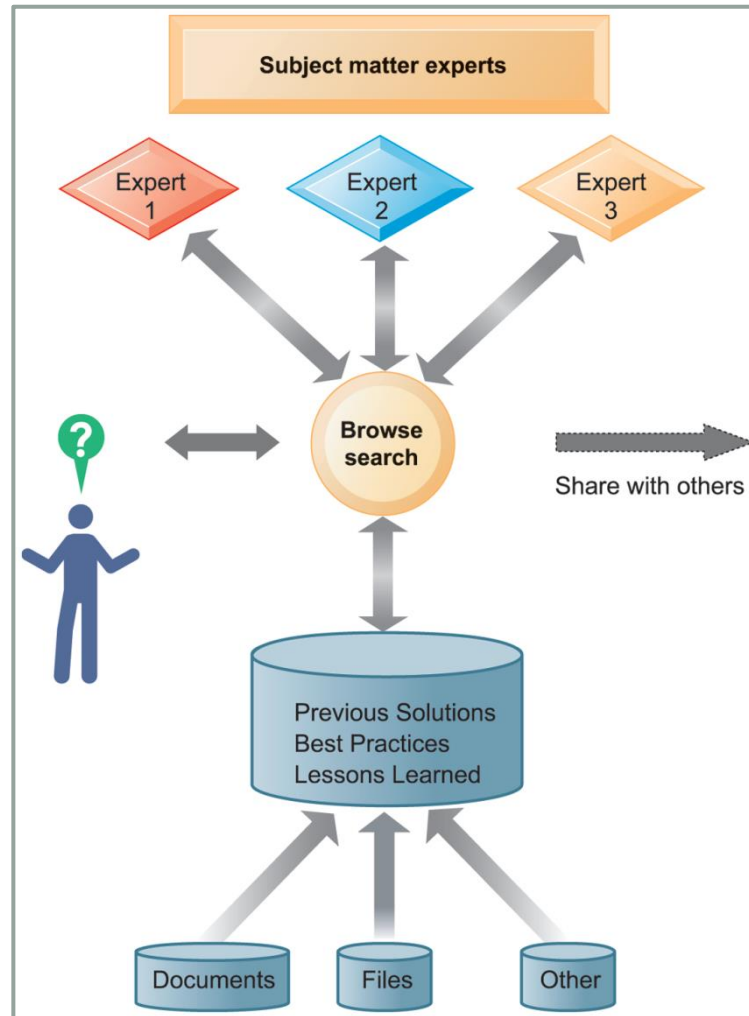
- **Enterprise content management systems**

  - **Key problem – Developing taxonomy**
    - Knowledge objects must be tagged with categories for retrieval

  - **Digital asset management systems**
    - Specialized content management systems for classifying, storing, managing unstructured digital data
    - Photographs, graphics, video, audio

- **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**
  - **May systematize solutions developed by experts and store them in knowledge database**
    - Best-practices
    - Frequently asked questions (FAQ) repository

AN ENTERPRISE KNOWLEDGE NETWORK SYSTEM

A knowledge network maintains a database of firm experts, as well as accepted solutions to known problems, and then facilitates the communication between employees looking for knowledge and experts who have that knowledge. Solutions created in this communication are then added to a database of solutions in the form of FAQs, best practices, or other documents.

Enterprise-Wide Knowledge Management Systems

- **Portal and collaboration technologies**
  - **Enterprise knowledge portals: Access to external and internal information**
    - News feeds, research
    - Capabilities for e-mail, chat, videoconferencing, discussion
  - **Use of consumer Web technologies**
    - Blogs
    - Wikis
    - Social bookmarking

Enterprise-Wide Knowledge Management Systems

- **Learning management systems**
  - **Provide tools for management, delivery, tracking, and assessment of various types of employee learning and training**
  - **Support multiple modes of learning**
    - CD-ROM, Web-based classes, online forums, live instruction, etc.
  - **Automates selection and administration of courses**
  - **Assembles and delivers learning content**
  - **Measures learning effectiveness**

- **Knowledge work systems**
  - **Systems for knowledge workers to help create new knowledge and integrate that knowledge into business**

- **Knowledge workers**
  - **Researchers, designers, architects, scientists, engineers who create knowledge for the organization**
  - **Three key roles:**
    1. Keeping organization current in knowledge
    2. Serving as internal consultants regarding their areas of expertise
    3. Acting as change agents, evaluating, initiating, and promoting change projects
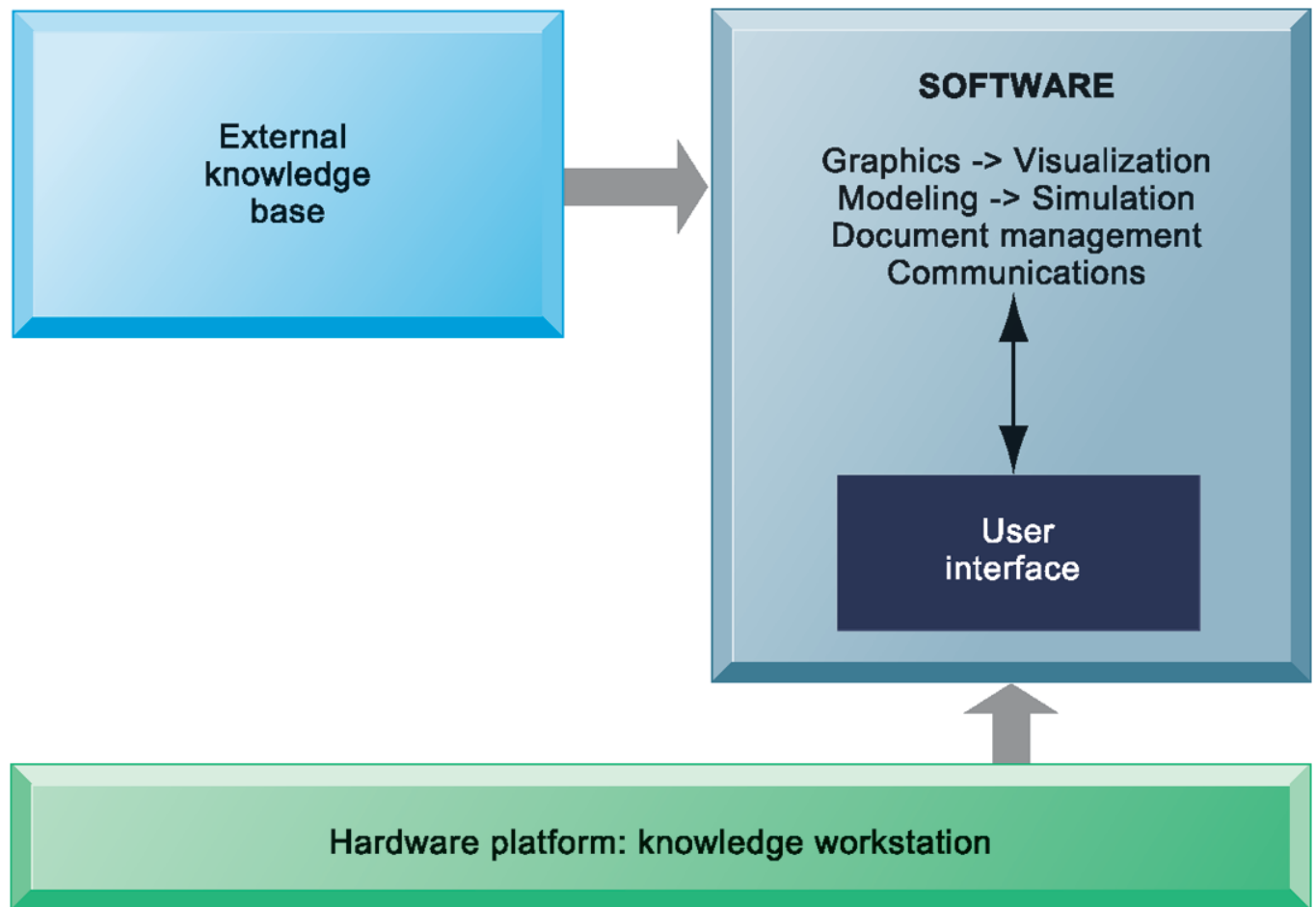
Knowledge Work Systems

- **Requirements of knowledge work systems**

  - Sufficient computing power for graphics, complex calculations

  - Powerful graphics and analytical tools

  - Communications and document management

  - Access to external databases

  - User-friendly interfaces

  - Optimized for tasks to be performed (design engineering, financial analysis)

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.

External knowledge base

SOFTWARE

Graphics -> Visualization
Modeling -> Simulation
Document management
Communications

User interface

Hardware platform: knowledge workstation

Knowledge Work Systems

- Examples of knowledge work systems
  - CAD (computer-aided design):
    - Creation of engineering or architectural designs
    - 3-D printing
  - Virtual reality systems:
    - Simulate real-life environments
    - 3-D medical modeling for surgeons
    - Augmented reality (AR) systems
    - VRML
  - Investment workstations:
    - Streamline investment process and consolidate internal, external data for brokers, traders, portfolio managers

Knowledge Work Systems

AUGMENTED REALITY: REALITY GETS BETTER

Read the Interactive Session and discuss the following questions

- **What is the difference between virtual reality and augmented reality?**

- **Why is augmented reality so appealing to marketers?**

- **What makes augmented reality useful for real estate shopping applications?**

- **Suggest some other knowledge work applications for augmented reality**

- **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 to complex problems:** Genetic algorithms
  - **Automating tasks:** Intelligent agents

- **Artificial intelligence (AI) technology:**
  - **Computer-based systems that emulate human behavior**

- **Expert systems:**
  - **Capture tacit knowledge in very specific and limited domain of human expertise**
  - **Capture knowledge of skilled employees as 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
  - **Used for discrete, highly structured decision-making**

- **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
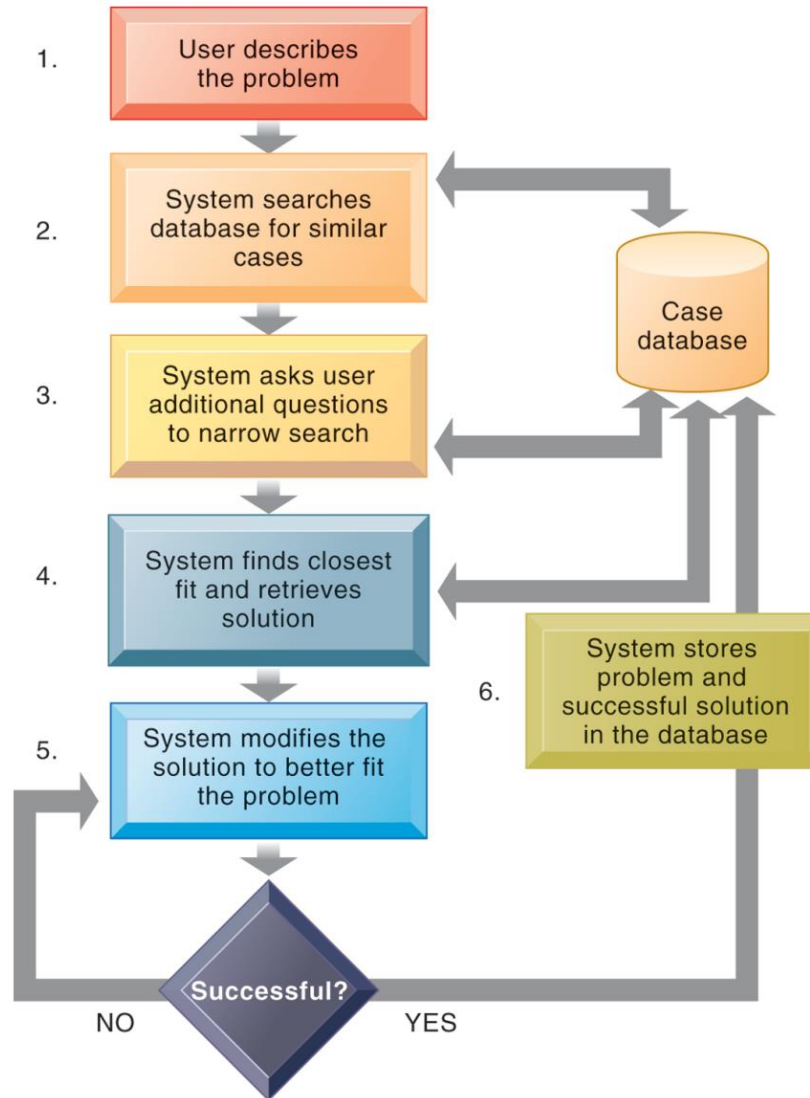
Intelligent Techniques

- **Successful expert systems**
  - Con-Way Transportation built expert system to automate and optimize planning of overnight shipment routes for nationwide freight-trucking business

- **Most expert systems deal with problems of classification**
  - Have relatively few alternative outcomes
  - Possible outcomes are known in advance

- **Many expert systems require large, lengthy, and expensive development and maintenance efforts**
  - Hiring or training more experts may be less expensive

- **Case-based reasoning (CBR)**
  - **Descriptions of past experiences of human specialists (cases), stored in knowledge base**
  - **System searches for 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

Intelligent Techniques

HOW CASE-BASED REASONING WORKS

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.

1. User describes the problem

2. System searches database for similar cases

3. System asks user additional questions to narrow search

4. System finds closest fit and retrieves solution

5. System modifies the solution to better fit the problem

6. System stores problem and successful solution in the database

Case database

Successful?

NO   YES

- **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 IF-THEN rules**
    - Autofocus in cameras
    - Detecting possible medical fraud
    - Sendai's subway system acceleration controls

Intelligent Techniques

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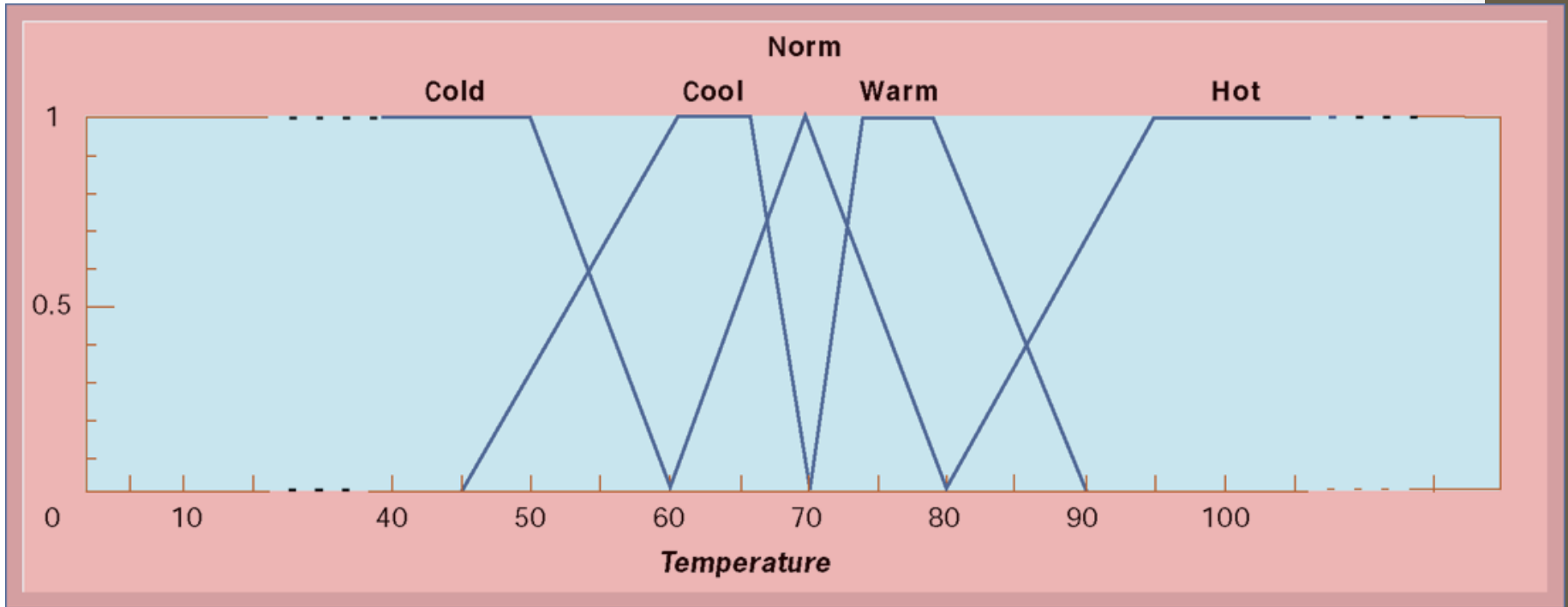
The membership functions for the input called temperature are in the logic of the thermostat to control the room temperature. Membership functions help translate linguistic expressions such as warm into numbers that the computer can manipulate.

- **Machine learning**
  - **How computer programs improve performance without explicit programming**
    - Recognizing patterns
    - Experience
    - Prior learnings (database)
  - **Contemporary examples**
    - Google searches
    - Recommender systems on Amazon, Netflix

Neural networks

- **Find patterns and relationships in massive amounts of data too complicated for humans to analyze**

- **"Learn" patterns by searching for relationships, building models, and correcting over and over again**

- **Humans "train" network by feeding it data inputs for which outputs are known, to help neural network learn solution by example**

- **Used in medicine, science, and business for problems in pattern classification, prediction, financial analysis, and control and optimization**

Intelligent Techniques

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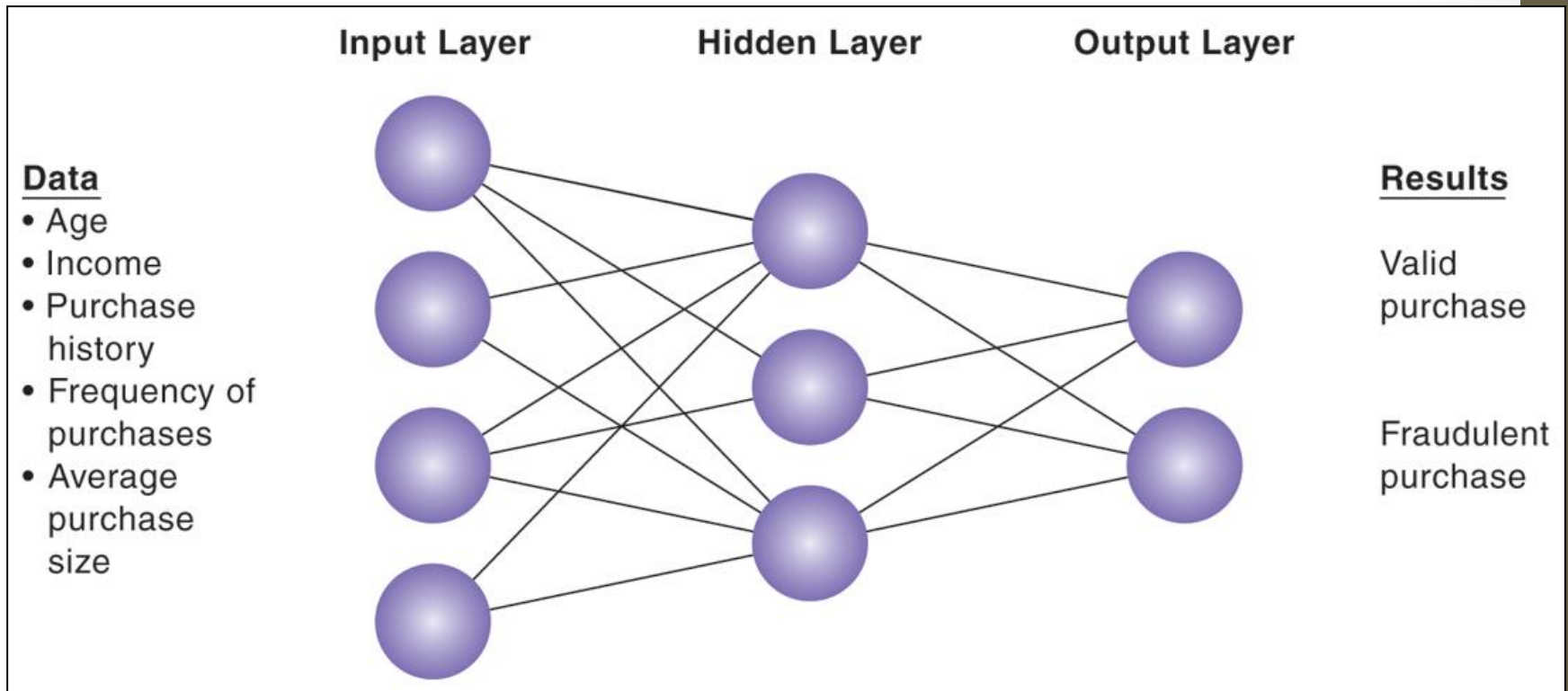
A neural network uses rules it "learns" from patterns in data to construct a hidden layer of logic. The hidden layer then processes inputs, classifying them based on the experience of the model. In this example, the neural network has been trained to distinguish between valid and fraudulent credit card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

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 inheritance, mutation, and selection

- **Used in optimization problems (minimization of costs, efficient scheduling, optimal jet engine design) in which hundreds or thousands of variables exist**

- **Able to evaluate many solution alternatives quickly**

Intelligent Techniques

THE COMPONENTS OF A GENETIC ALGORITHM

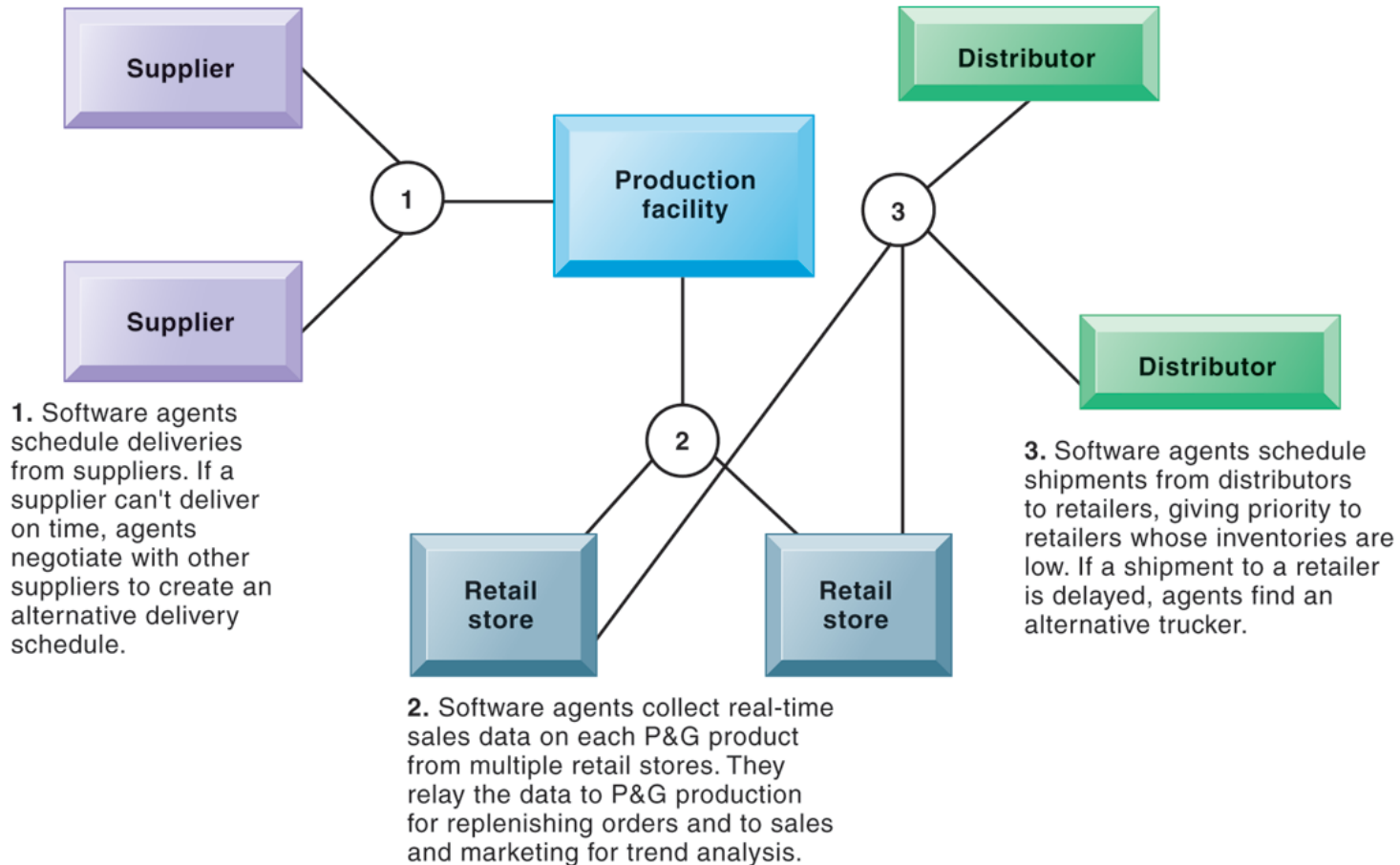|		Length	Width	Weight	Fitness
1 1 0 1 1 0	1	Long	Wide	Light	55
1 0 1 0 0 0	2	Short	Narrow	Heavy	49
0 0 0 1 0 1	3	Long	Narrow	Heavy	36
1 0 1 1 0 1	4	Short	Medium	Light	61
0 1 0 1 0 1	5	Long	Medium	Very light	74
A population of chromosomes		Decoding of chromosomes		Evaluation of chromosomes	

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.

- **Intelligent agents**
  - **Work without direct human intervention to carry out specific, repetitive, and predictable tasks for user, process, or application**
    - Deleting junk e-mail
    - Finding cheapest airfare
  - **Use limited built-in or learned knowledge base**
    - Some are capable of self-adjustment, for example: Siri
  - **Agent-based modeling applications:**
    - Systems of autonomous agents
    - Model behavior of consumers, stock markets, and supply chains; used to predict spread of epidemics

Intelligent Techniques

INTELLIGENT AGENTS IN P&G'S SUPPLY CHAIN NETWORK

1. Software agents schedule deliveries from suppliers. If a supplier can't deliver on time, agents negotiate with other suppliers to create an alternative delivery schedule.

2. Software agents collect real-time sales data on each P&G product from multiple retail stores. They relay the data to P&G production for replenishing orders and to sales and marketing for trend analysis.

3. Software agents schedule shipments from distributors to retailers, giving priority to retailers whose inventories are low. If a shipment to a retailer is delayed, agents find an alternative trucker.

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

- **Hybrid AI systems**

  - **Genetic algorithms, fuzzy logic, neural networks, and expert systems integrated into single application to take advantage of best features of each**

  - **For example: Matsushita "neurofuzzy" washing machine that combines fuzzy logic with neural networks**