Fundamentals of Information Systems, Seventh Edition

Chapter 7
Knowledge Management and Specialized Information Systems

Why Learn About Knowledge Management and Specialized Information Systems?

- Knowledge management and specialized information systems are used in almost every industry
- Learning about these systems:
  - Will help you discover new ways to use information systems in your day-to-day work

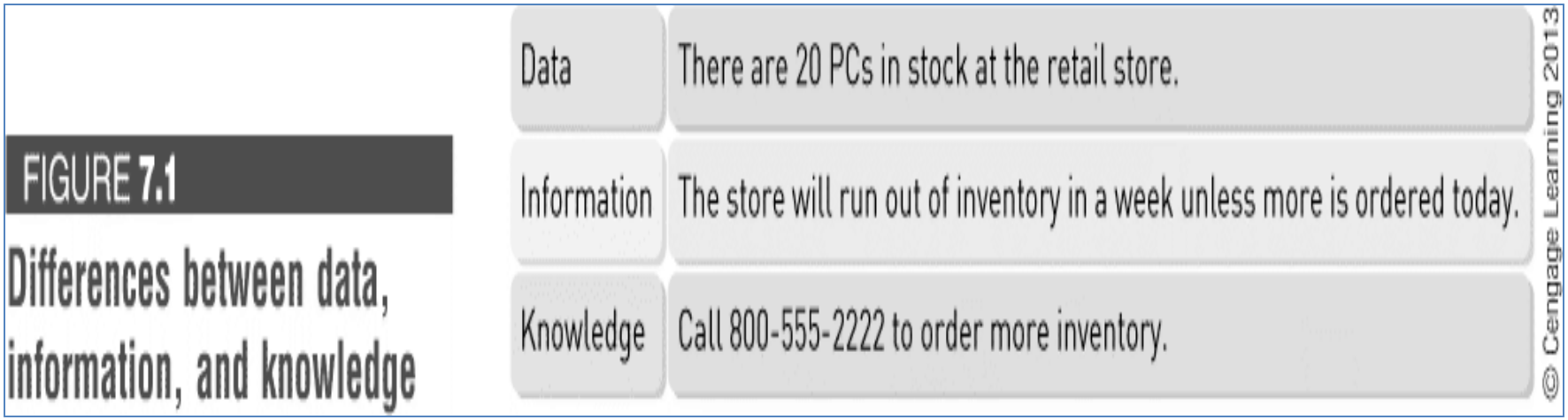
Knowledge Management Systems

- Data consists of raw facts
- Information:
  - Collection of facts organized so that they have additional value beyond the value of the facts themselves
- Knowledge:
  - Awareness and understanding of a set of information and the ways that information can be made useful to support a specific task or reach a decision

Knowledge Management Systems (continued)

- Knowledge management system (KMS):
  - Organized collection of people, procedures, software, databases, and devices
  - Used to create, store, share, and use the organization's knowledge and experience

Knowledge Management Systems



Data	There are 20 PCs in stock at the retail store.
Information	The store will run out of inventory in a week unless more is ordered today.
Knowledge	Call 800-555-2222 to order more inventory.

FIGURE 7.1

Differences between data, information, and knowledge

Overview of Knowledge Management Systems

- Explicit knowledge:
  - Objective
  - Can be measured and documented in reports, papers, and rules
- Tacit knowledge:
  - Hard to measure and document
  - Typically not objective or formalized
- Many organizations attempt to convert tacit knowledge to explicit knowledge

Data and Knowledge Management Workers and Communities of Practice

- Data workers:
  - Secretaries, administrative assistants, bookkeepers, data entry people, etc.
- Knowledge workers:
  - Create, use, and disseminate knowledge
  - Professionals in science, engineering, or business; writers; researchers; educators; corporate designers; etc.

Data and Knowledge Management Workers and Communities of Practice (continued)

- Chief knowledge officer (CKO):
  - Top-level executive who helps the organization use a KMS to create, store, and use knowledge to achieve organizational goals
- Communities of practice (COP):
  - Group of people dedicated to a common discipline or practice
  - May be used to create, store, and share knowledge

Obtaining, Storing, Sharing, and Using Knowledge

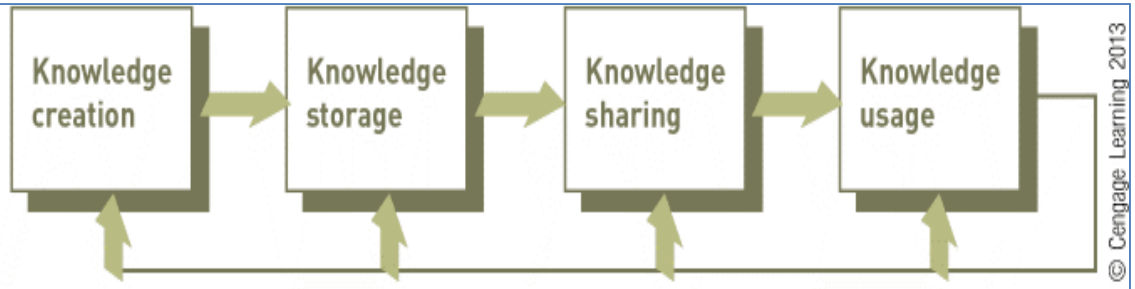
- Knowledge workers:
  - Often work in teams
  - Can use collaborknowledge worker ative work software and group support systems to share knowledge
- Knowledge repository:
  - Includes documents, reports, files, and databases
- **Knowledge map** points the to the needed knowledge

Obtaining, Storing, Sharing, and Using Knowledge (continued)

FIGURE 7.3

Knowledge management system

Obtaining, storing, sharing, and using knowledge is the key to any KMS.



Technology to Support Knowledge Management

- Effective KMS:
  - Is based on learning new knowledge and changing procedures and approaches as a result
- Data mining and business intelligence can help capture and use knowledge
- IBM Lotus Notes and Microsoft Dashboard, Web Store Technology, and Access Workflow Designer are knowledge management tools

Technology to Support Knowledge Management (continued)

TABLE 7.1 Additional Knowledge Management Organizations and Resources

Company	Description	Web Site
Knowledge Management World	Knowledge management publications, conferences, and information.	*http://www.kmworld.com/*[11]
Knowledge Management Online	Provides online information, articles, and blogs on knowledge management	*http://www.knowledge-management-online.com/*[12]
CortexPro	Knowledge management collaboration tools	*www.cortexpro.com*[13]
Delphi Group	A knowledge management consulting company	*www.delphigroup.com*[14]
KM Knowledge	Knowledge management sites, products and services, magazines, and case studies	*www.kmknowledge.com*[15]
Knowledge Management Solutions, Inc.	Tools to create, capture, classify, share, and manage knowledge	*www.kmsi.us*[16]
KnowledgeBase	Content creation and management	*www.knowledgebase.com*[17]

An Overview of Artificial Intelligence

- Artificial intelligence (AI):
  - Computers with the ability to mimic or duplicate the functions of the human brain
- Computer systems that use the notion of AI:
  - Play Jeopardy
  - Help to make medical diagnoses
  - Pick and trade stocks

Artificial Intelligence in Perspective

- Artificial intelligence systems:
  - Include the people, procedures, hardware, software, data, and knowledge needed to develop computer systems and machines that demonstrate characteristics of intelligence

The Nature of Intelligence

- Turing Test:
  - Determines whether responses from a computer with intelligent behavior are indistinguishable from those from a human being
- Characteristics of intelligent behavior include the ability to:
  - Learn from experiences and apply knowledge acquired from experience
  - Handle complex situations
  - Solve problems when important information is missing

The Nature of Intelligence (continued)

- Characteristics of intelligent behavior include the ability to (continued):
  - Determine what is important
  - React quickly and correctly to a new situation
  - Understand visual images
  - Process and manipulate symbols
  - Be creative and imaginative
  - Use heuristics

The Brain Computer Interface

- Brain Computer Interface (BCI):
  - Idea is to directly connect the human brain to a computer and have human thought control computer activities
- If successful:
  - The BCI experiment will allow people to control computers and artificial arms and legs through thought alone

The Major Branches of Artificial Intelligence

- AI is a broad field that includes:
  - Expert systems and robotics
  - Vision systems and natural language processing
  - Learning systems and neural networks
- Expert systems:
  - Hardware and software that stores knowledge and makes inferences, similar to a human expert

The Major Branches of Artificial Intelligence (continued)

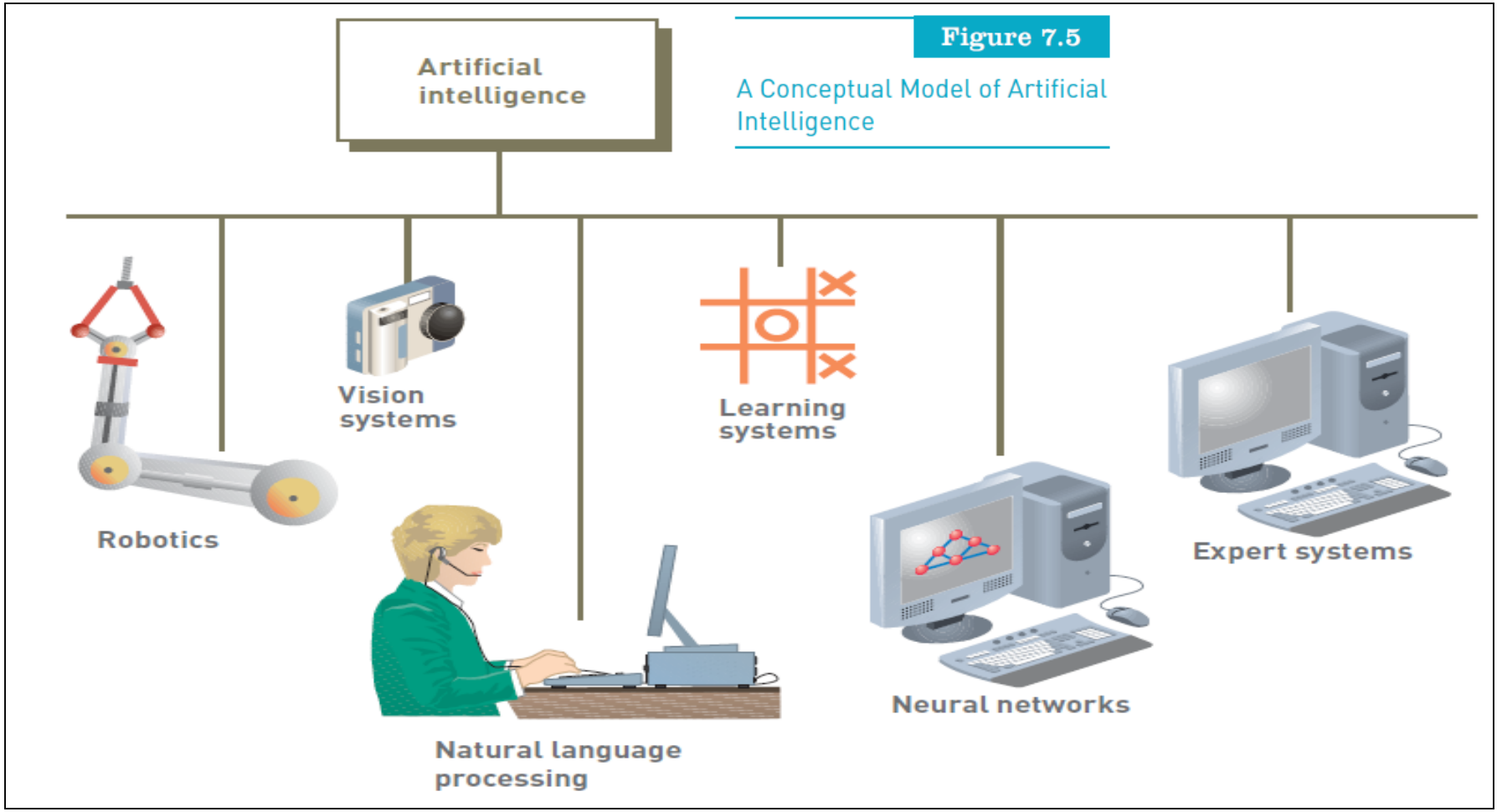


Figure 7.5

A Conceptual Model of Artificial Intelligence

Robotics

- Developing mechanical devices that can:
  - Paint cars, make precision welds, and perform other tasks that require a high degree of precision
- Manufacturers use robots to assemble and paint products
- Contemporary robotics:
  - Combine both high-precision machine capabilities and sophisticated controlling software

Vision Systems

- Hardware and software that permit computers to capture, store, and manipulate visual images and pictures
- Effective at identifying people based on facial features

Natural Language Processing and Voice Recognition

- Processing that allows the computer to understand and react to statements and commands made in a “natural” language, such as English
- Voice recognition:
  - Converting sound waves into words

Learning Systems

- Combination of software and hardware that:
  - Allows the computer to change how it functions or reacts to situations based on feedback it receives
- Learning systems software:
  - Requires feedback on results of actions or decisions

Neural Networks

- Computer system that simulates functioning of a human brain
- Can process many pieces of data at the same time and learn to recognize patterns
- Neural network program:
  - Helps engineers slow or speed drilling operations to help increase drilling accuracy and reduce costs

Other Artificial Intelligence Applications

- Genetic algorithm:
  - Approach to solving complex problems in which a number of related operations or models change and evolve until the best one emerges
- Intelligent agent:
  - Programs and a knowledge base used to perform a specific task for a person, a process, or another program

An Overview of Expert Systems

- Computerized expert systems:
  - Use heuristics, or rules of thumb, to arrive at conclusions or make suggestions
- The U.S. Army:
  - Uses the Knowledge and Information Fusion Exchange (KnIFE) expert system to help soldiers in the field make better military decisions

When to Use Expert Systems

- People and organizations should develop an expert system if it can:
  - Provide a high potential payoff or significantly reduce downside risk
  - Capture and preserve irreplaceable human expertise
  - Solve a problem that is not easily solved using traditional programming techniques
  - Develop a system more consistent than human experts

When to Use Expert Systems (continued)

- People and organizations should develop an expert system if it can (continued):
  - Provide expertise needed at a number of locations at the same time or in a hostile environment that is dangerous to human health
  - Provide expertise that is expensive or rare
  - Develop a solution faster than human experts can
  - Provide expertise needed for training and development

Components of Expert Systems

- Expert system:
  - Consists of a collection of integrated and related components
- Knowledge base:
  - Stores all relevant information, data, rules, cases, and relationships used by expert system
  - Creates knowledge base by:
    - Using rules
    - Using cases

Components of Expert Systems (continued)

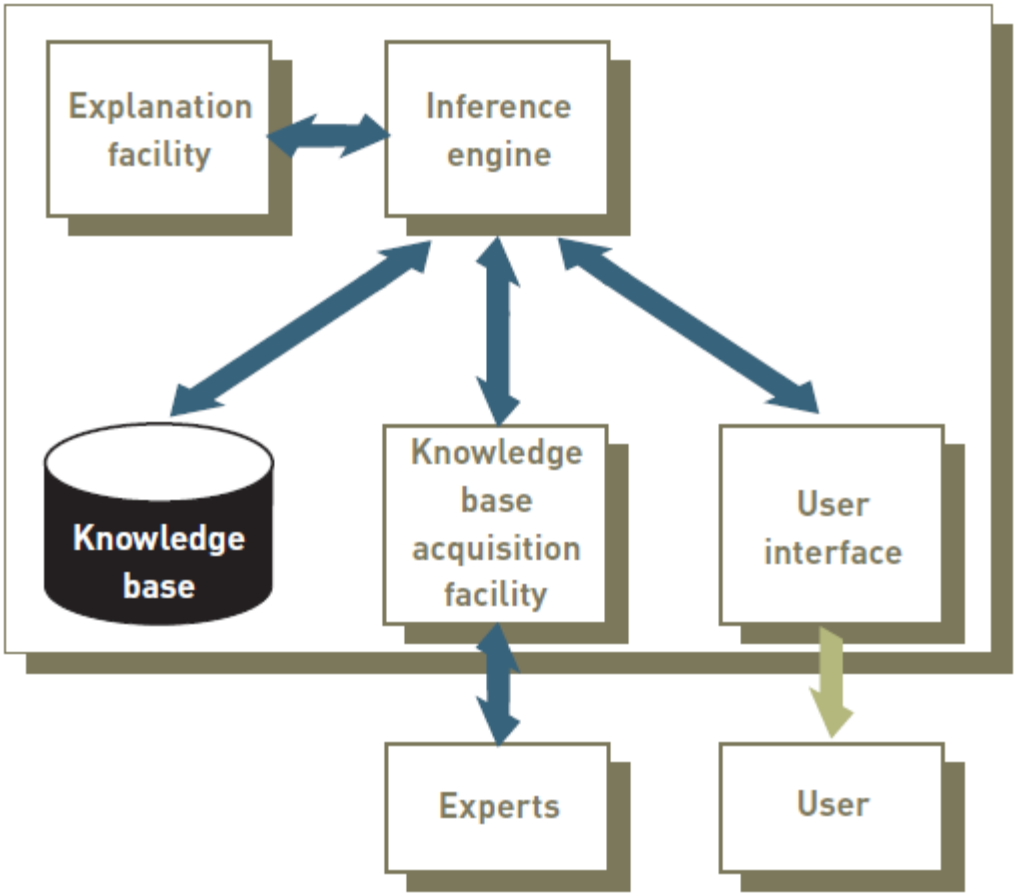


Figure 7.7

Components of an Expert System

The Inference Engine

- Purpose:
  - To seek information and relationships from the knowledge base
  - To provide answers, predictions, and suggestions, like a human expert

The Explanation Facility

- Allows a user or decision maker to understand how the expert system arrived at certain conclusions or results
- Example:
  - A doctor can find out the logic or rationale of a diagnosis made by a medical expert system

The Knowledge Acquisition Facility

- Provides convenient and efficient means of capturing and storing all components of knowledge base
- Knowledge acquisition software:
  - Can present users and decision makers with easy-to-use menus

The Knowledge Acquisition Facility (continued)

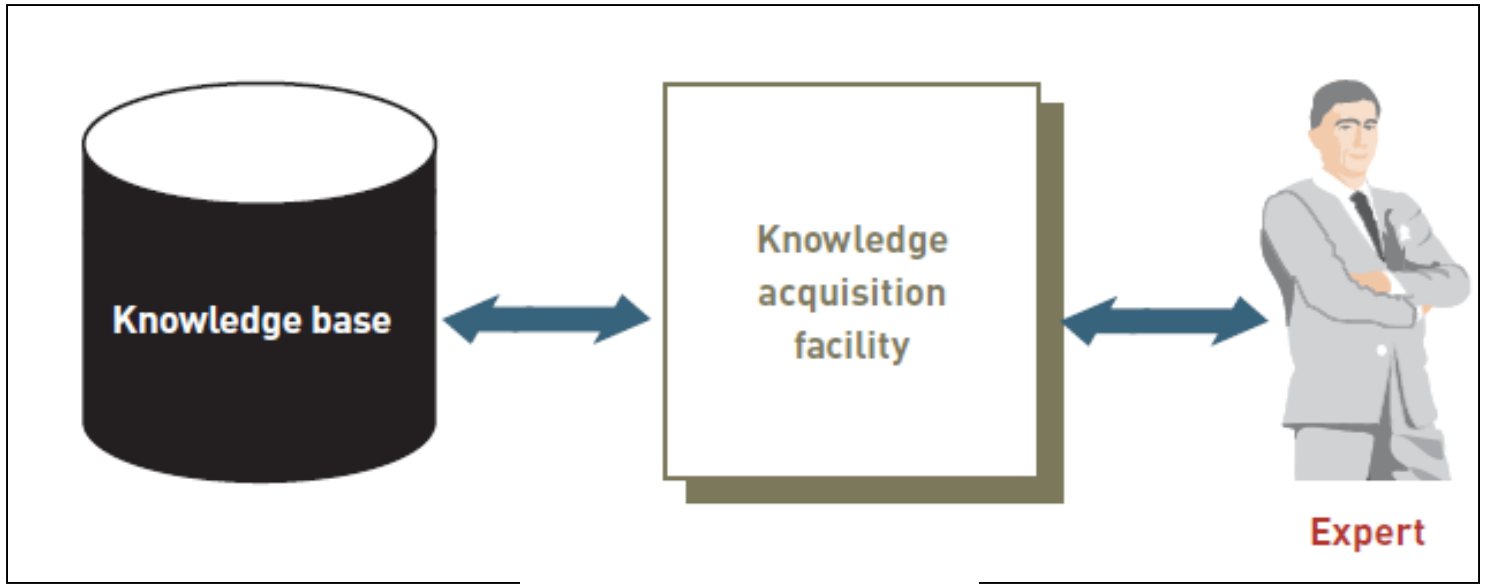


Figure 7.10

Knowledge Acquisition Facility

The knowledge acquisition facility acts as an interface between experts and the knowledge base.

The User Interface

- Permits decision makers to develop and use their own expert systems
- Main purpose:
  - To make development and use of an expert system easier for users and decision makers

Participants in Developing and Using Expert Systems

- Domain expert:
  - Person or group with the expertise or knowledge the expert system is trying to capture
- Knowledge engineer:
  - Person who has training or experience in the design, development, implementation, and maintenance of an expert system
- Knowledge user:
  - Person or group who uses and benefits from the expert system

Participants in Developing and Using Expert Systems (continued)

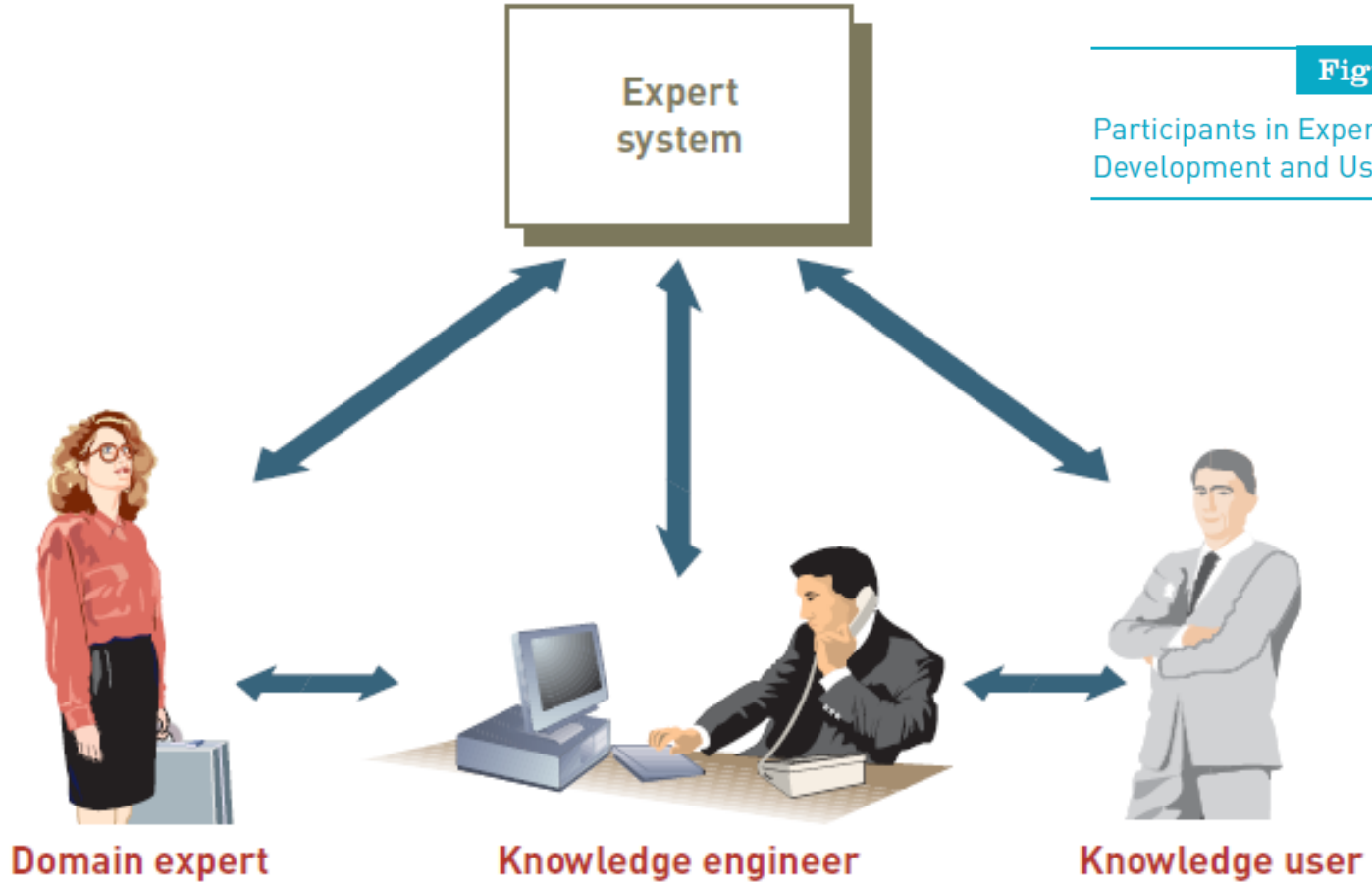


Figure 7.11

Participants in Expert Systems Development and Use

Expert Systems Development Tools and Techniques

- Theoretically, expert systems can be developed from any programming language
- Expert system shells and products:
  - Collections of software packages and tools used to design, develop, implement, and maintain expert systems

Expert Systems Development Tools and Techniques (continued)

Name of Product	Application and Capabilities
Exsys Corvid	An expert system tool that simulates a conversation with a human expert from Exsys *(www.exsys.com)*[53]
EZ-Xpert	A rule-based expert system that results in complete applications in the C++ or Visual Basic programming languages by EZ-Xpert *(www.ez-xpert.com)*[54]
G2	Assists in oil and gas operations; Transco, a British company, uses it to help in the transport of gas to more than 20 million commercial and domestic customers
HazMat Loader	Analyzes hazardous materials in truck shipments *(http://hazmat.dot.gov)*
Imprint Business Systems	Has an expert system that helps printing and packaging companies manage their businesses *(www.imprint-mis.co.uk)*
Lantek Expert System	Helps metal fabricators reduce waste and increase profits *(www.lantek.es)*
RAMPART	Developed by Sandia National Laboratories, the U.S. General Services Administration (GSA) uses it to analyze risk to the approximately 8,000 federal buildings it manages *(www.sandia.gov)*

Table 7.2

Popular Expert System Products

Multimedia and Virtual Reality

- Use of multimedia and virtual reality:
  - Has helped many companies achieve a competitive advantage and increase profits
- The approach and technology used in multimedia:
  - Is often the foundation of virtual reality systems

Overview of Multimedia

- Multimedia is:
  - Text and graphics
  - Audio
  - Video and animation
  - File conversion and compression

Overview of Virtual Reality

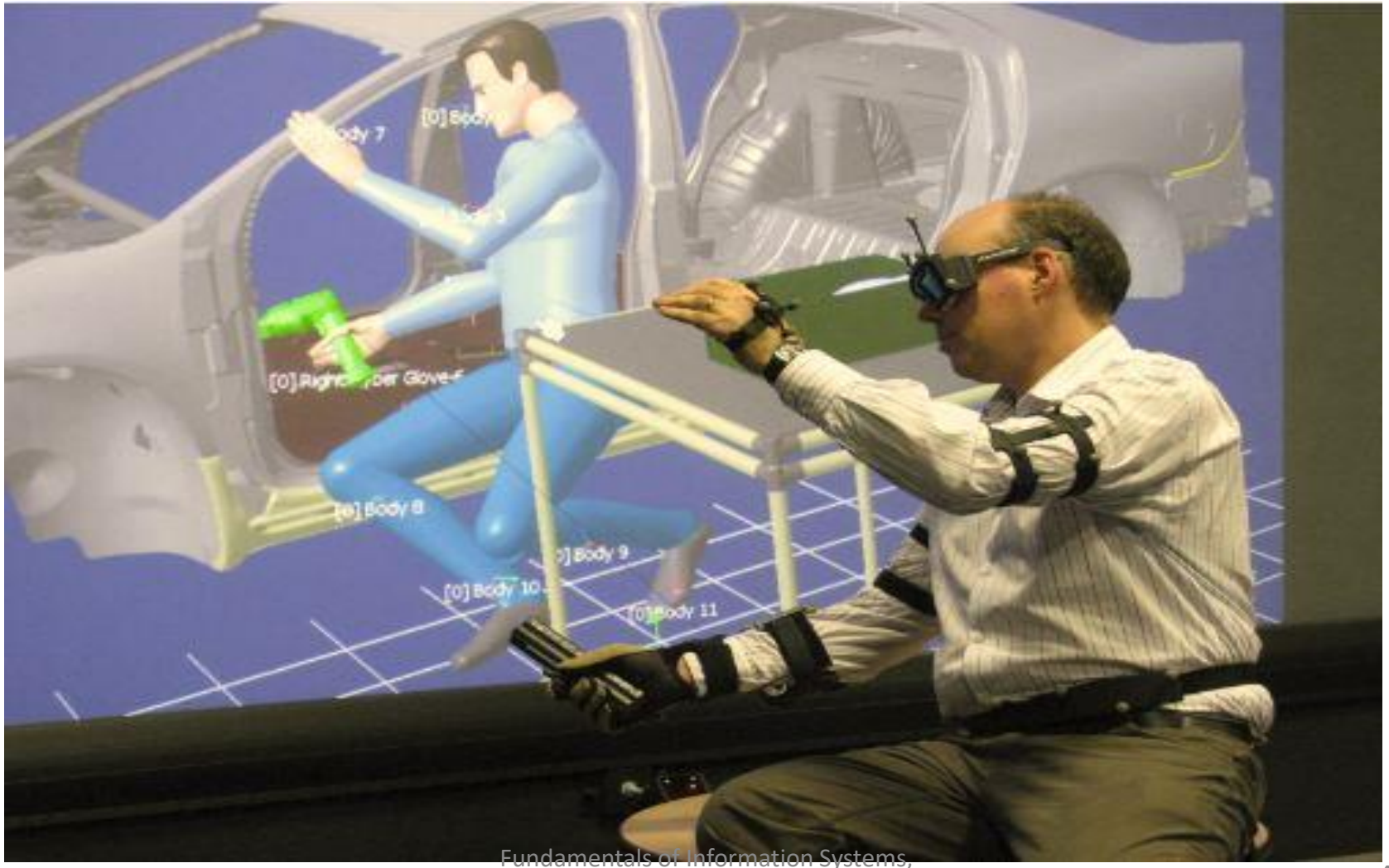
- Virtual reality system:
  - Enables one or more users to move and react in a computer-simulated environment
- Immersive virtual reality:
  - User becomes fully immersed in an artificial, 3D world that is completely generated by a computer

Interface Devices

- To see in a virtual world:
  - Often the user wears a head-mounted display (HMD) with screens directed at each eye
- Haptic interface:
  - Relays sense of touch and other sensations in a virtual world
  - Most challenging to create


ttp://cave.ncsa.uiuc.edu

The haptic interface

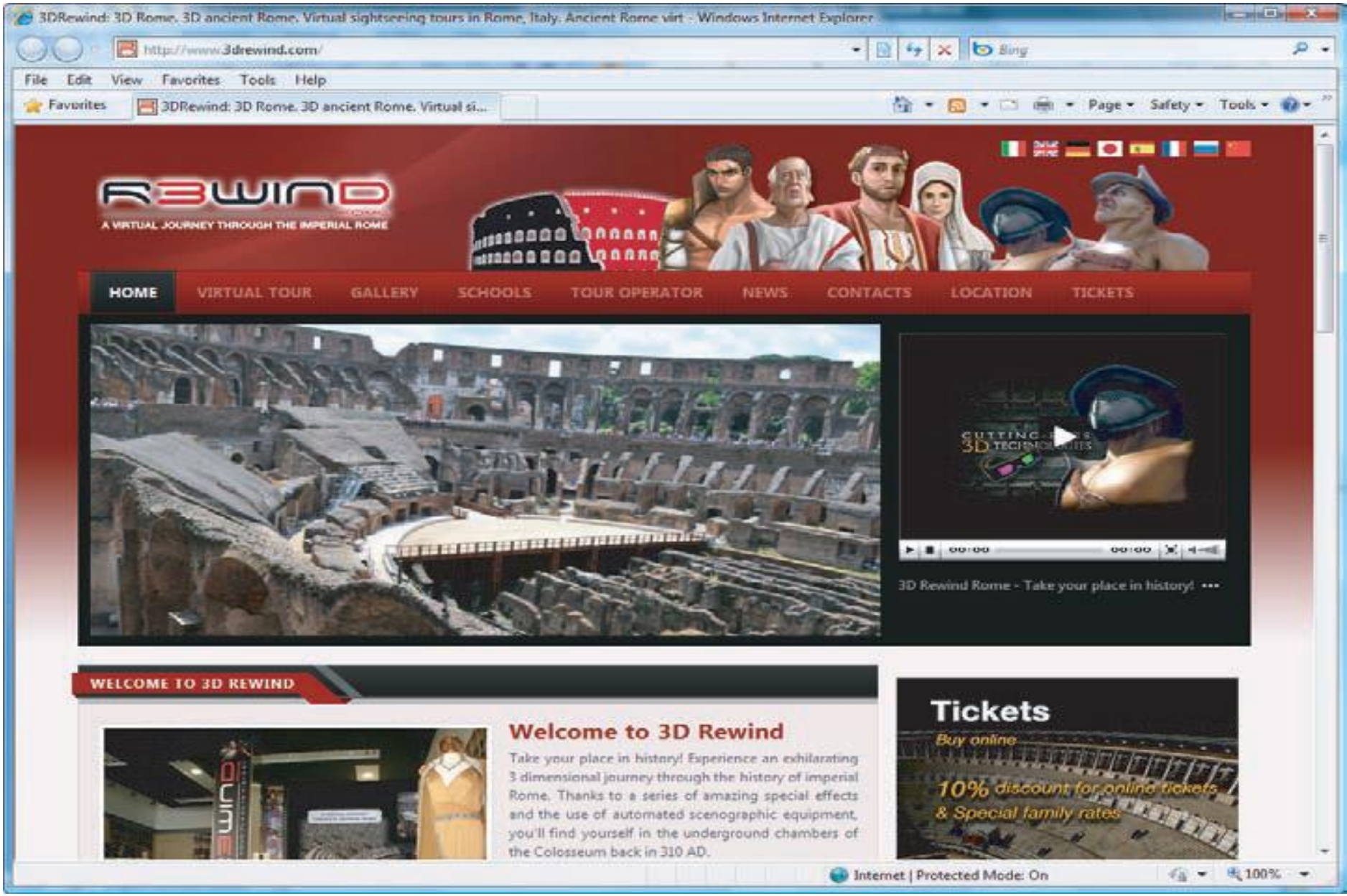


Forms of Virtual Reality

- Immersive virtual reality
- Applications that are not fully immersive:
  - Mouse-controlled navigation through a 3D environment on a graphics monitor
  - Stereo projection systems
  - Stereo viewing from the monitor via stereo glasses

Virtual Reality Applications

- Medicine:
  - VR program called SnowWorld helps treat burn patients
- Education and training:
  - Virtual technology has also been applied by the military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VIRTUAL TOUR
GALLERY
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3D Rewind Rome - Take your place in history!
WELCOME TO 3D REWIND
Welcome to 3D Rewind
Take your place in history! Experience an exhilarating 3 dimensional journey through the history of imperial Rome. Thanks to a series of amazing special effects and the use of automated scenographic equipment, you'll find yourself in the underground chambers of the Colosseum back in 310 AD.
Tickets
Buy online
10% discount for online tickets
& Special family rates
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100%

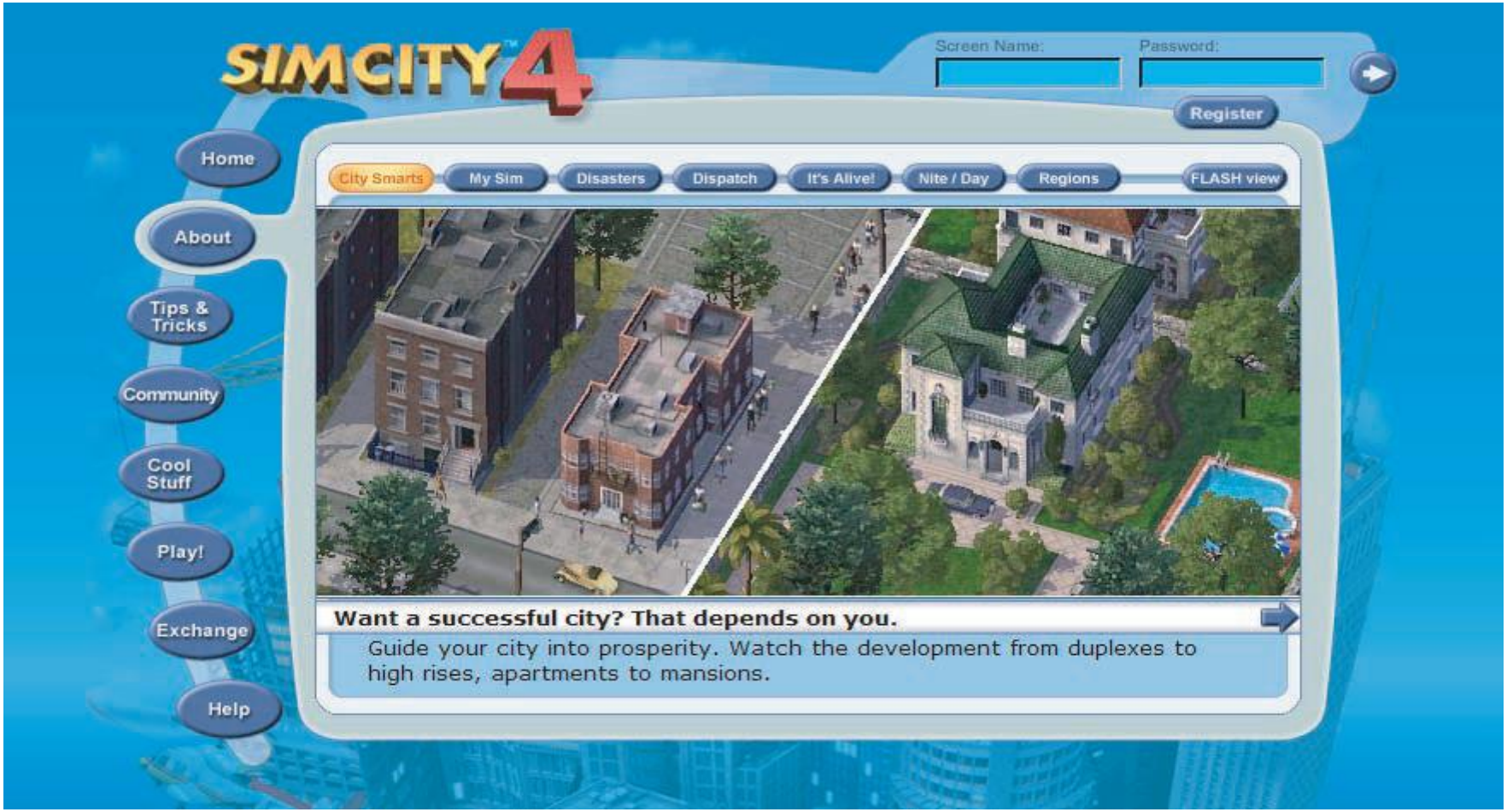
Virtual Reality Applications (continued)

- Business and Commerce:
  - Boeing used virtual reality to help it design and manufacture airplane parts and new planes
- Entertainment:
  - Movies use CGI to bring realism to the silver screen


ALARMS EXCEEDED
81
77
102/65
20.8
93 %
Blood Tests
Radiology
Crash Cart

(www.secondlife.com)

SimCity (*http://simcity.ea.com/), a virtual reality game, allows people* to experiment with decisions related to urban planning



Specialized Systems

- Segway:
  - Uses sophisticated software, sensors, and gyro motors to transport people
- Radio Frequency Identification (RFID) tags:
  - Contain small chips with information about products or packages
  - Can be quickly scanned to perform inventory control

Specialized Systems (continued)

- Game theory:
  - Involves the use of information systems to develop competitive strategies for people, organizations, or even countries
- Informatics:
  - Combines traditional disciplines, such as science and medicine, with computer systems and technology

Summary

- Knowledge:
  - Awareness and understanding of a set of information
- Knowledge workers:
  - People who create, use, and disseminate knowledge
- Artificial intelligence:
  - Broad field that includes:
    - Expert systems, robotics, vision systems
    - Natural language processing, learning systems, and neural networks

Summary (continued)

- Expert system consists of a collection of integrated and related components
- Inference engine:
  - Processes the rules, data, and relationships stored in the knowledge base
- Virtual reality system:
  - Enables one or more users to move and react in a computer-simulated environment

Summary (continued)

- Virtual reality:
  - Can refer to applications that are not fully immersive
- Specialized systems:
  - Segway
  - Radio Frequency Identification (RFID) tags
  - Game theory