Managing Knowledge and Collaboration


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.

Important Dimensions of Knowledge (1/4)

• 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)

Important Dimensions of Knowledge (2/4)

• 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
**Important Dimensions of Knowledge (3/4)**

- 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

**Knowledge Management Value Chain (1/7)**

- **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**
  - **Knowledge storage**
  - **Knowledge dissemination**
  - **Knowledge application**

**Important Dimensions of Knowledge (4/4)**

- **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 Value Chain (2/7)**

- **Knowledge management value chain**
  - **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 (3/7)

- Knowledge management value chain:
  - 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 (4/7)

- Knowledge management value chain:
  - 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 (5/7)

- Knowledge management value chain:
  - 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

Knowledge Management Value Chain (6/7)

The Knowledge Management Value Chain

Knowledge management today involves both information systems activities and a host of enabling management and organizational activities.
Knowledge Management Value Chain (7/7)

- 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

Types of KM Systems (1/2)

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

Types of KM Systems (2/2)

Major Types of Knowledge Management Systems

- Enterprise-wide Knowledge Management Systems
  - General purpose, integrated, firm-wide efforts to collect, store, disseminate, and use digital content and knowledge
- Knowledge Work Systems
  - Specialized workstations and systems that enable scientists, engineers, and other knowledge workers to enable and discover new knowledge
  - Computer-aided design (CAD)
  - 3D visualization
  - 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.

Figure 11-3

Enterprise-Wide KM Systems (1/8)

- Three major types of knowledge in enterprise
  - Structured documents
    - Reports, presentations
  - Formal rules
  - Semistructured documents
    - E-mails, videos
  - Unstructured, tacit knowledge
  - 80% of an organization’s business content is semistructured or unstructured
Enterprise-wide 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

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
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.

Figure 11-5

- **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 ensure that knowledge is properly integrated into business
  - Researchers, designers, architects, scientists, and engineers who create knowledge and information for the organization
  - Three key 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

- **Major knowledge management system vendors**
  - Include powerful portal and collaboration technologies
  - Portal technologies: Access to external information
  - News feeds, research
  - Access to internal knowledge resources
  - Collaboration tools
    - E-mail
    - Discussion groups
    - Blogs
    - Wikis
    - Social bookmarking
Knowledge Work Systems (2/4)

• Requirements of 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)

Knowledge Work Systems (3/4)

Requirements of Knowledge Work Systems

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

Knowledge Work Systems (4/4)

• Examples of knowledge work systems
  • CAD (computer-aided design): 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: Specifications for interactive, 3D modeling over Internet
  • Investment workstations: Streamline investment process and consolidate internal, external data for brokers, traders, portfolio managers

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 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

**Figure 11-7**
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.

**Rules in an Expert System**

**Figure 11-8**
An inference engine works by searching through the rules and "firing" those rules that are triggered by facts gathered and entered by the user. A collection of rules is similar to a series of nested IF statements in a traditional software system; however the magnitude of the statements and degree of nesting are much greater in an expert system.
Expert Systems (5/5)

• 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 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

Hybrid AI Systems

• 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

Intelligent Agents (1/2)

• Intelligent agents
  • Work in background to carry out specific, repetitive, and predictable tasks for user, process, or software application
  • Use limited built-in or learned knowledge base to accomplish tasks or make decisions on user’s behalf
    • Deleting junk e-mail
    • Finding cheapest airfare
  • Agent-based modeling applications:
    • Systems of autonomous agents
    • Model behavior of consumers, stock markets, and supply chains; used to predict spread of epidemics

Intelligent Agents (2/2)

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 chains. They relay the data to P&G production for reordering systems 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 Procter & Gamble shorten the replenishment cycles for products such as a box of Tide.