Chapter 11
Managing Knowledge

Learning Objectives

- What is the role of knowledge management and knowledge management programs in business?
- What types of systems are used for enterprise-wide knowledge management and how do they provide value for businesses?
- What are the major types of knowledge work systems and how do they provide value for firms?
- What are the business benefits of using intelligent techniques for knowledge management?

Problem: Fragmented systems and data; complex business processes

Solutions: Implement new product lifetime management (PLM) system and collaborative 3D product design environment

Demonstrates IT’s role in creating and sharing knowledge to improve business efficiency

Illustrates how information systems for knowledge management can increase productivity and quality

Jaguar Land Rover Transforms with New Design and Technology
Video Case: IBM Watson

https://www.youtube.com/watch?v=DywO4zksfXw

Knowledge management systems among fastest growing areas of software investment

Information economy
- 37 percent U.S. labor force: knowledge and information workers
- 45 percent U.S. GDP from knowledge and information sectors

Substantial part of a firm’s stock market value is related to intangible assets: knowledge, brands, reputations, and unique business processes

Well-executed knowledge-based projects can produce extraordinary ROI

The Role of Knowledge Management in Business

- 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)
9

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

- 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**
  - For example, Having a unique build-to-order production system

8

• **Knowledge is situational.**
  - Conditional: Knowing when to apply procedure
  - Contextual: Knowing circumstances to use certain tool

7

• **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 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

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

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.
The Role of Knowledge Management in Business

- Knowledge management value chain
  3. Knowledge dissemination
     - Portals, wikis
     - E-mail, instant messaging
     - 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
  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

- 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
Three 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 Role of Knowledge Management in Business

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 percent of an organization’s business content is semistructured or unstructured.

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
  - Blogs, wikis, and so on
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

Locating and sharing expertise
- Provide online directory of corporate experts in well-defined knowledge domains
- Search tools enable employees to find appropriate expert in a company
- Social networking and social business tools for finding knowledge outside the firm
  - Saving, tagging, sharing Web pages

Learning management systems (LMS)
- Provide tools for management, delivery, tracking, and assessment of employee learning and training
- Support multiple modes of learning
  - CD-ROM, Web-based classes, online forums, and so on
- Automates selection and administration of courses
- Assembles and delivers learning content
- Measures learning effectiveness

Massively open online courses (MOOCs)
- Web course open to large numbers of participants
Knowledge Work Systems

- **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

Examples of knowledge work systems

- **CAD (computer-aided design):**
  - Creation of engineering or architectural designs
  - 3D printing

- **Virtual reality systems:**
  - Simulate real-life environments
  - 3D medical modeling for surgeons
  - Augmented reality (AR) systems
  - VRML

- **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
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

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
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.

**Intelligent Techniques**

**Genetic algorithms**
- 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 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
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