Week 3: Chapter 3

Knowledge Management Solutions

Chapter Objectives

- Understand the concept of knowledge management
- Examine knowledge management solutions
- Describe four levels of knowledge management solutions:
  - KM processes
  - KM systems
  - KM mechanisms and technologies
  - KM infrastructure

Knowledge Management

- *Management is* doing what is needed to get the most out of some resources (examples of resources: assets, supply chains, customer relationships, human resources, …)
- Knowledge Management (KM) may simply be defined as *doing what is needed to get the most out of knowledge resources*.
- Generally, "get the most" implies:
  - *knowledge management*= acting so as to maximize the return from knowledge resources (implies cost/benefit analysis!)
- Specifically, "doing what is needed" implies:
  - Knowledge management = *performing the activities* involved in (1) *discovering*, (2) *capturing*, (3) *sharing*, and (4) *applying* knowledge so as to enhance, in a *cost-effective* fashion, the impact of knowledge on the unit's goal achievement.

Knowledge Resources

- In general, the term *knowledge resources* may refer to:
  - the knowledge currently possessed by an individual
  - the knowledge currently possessed by an organization:
    - corporation
    - firm
    - field office of a firm
    - department within a corporation or firm
    - …
- The term knowledge resources refers not only to the knowledge **currently possessed** by the individual or the organization but also to the knowledge that can **potentially be obtained** (at some cost if necessary) from other individuals or organizations

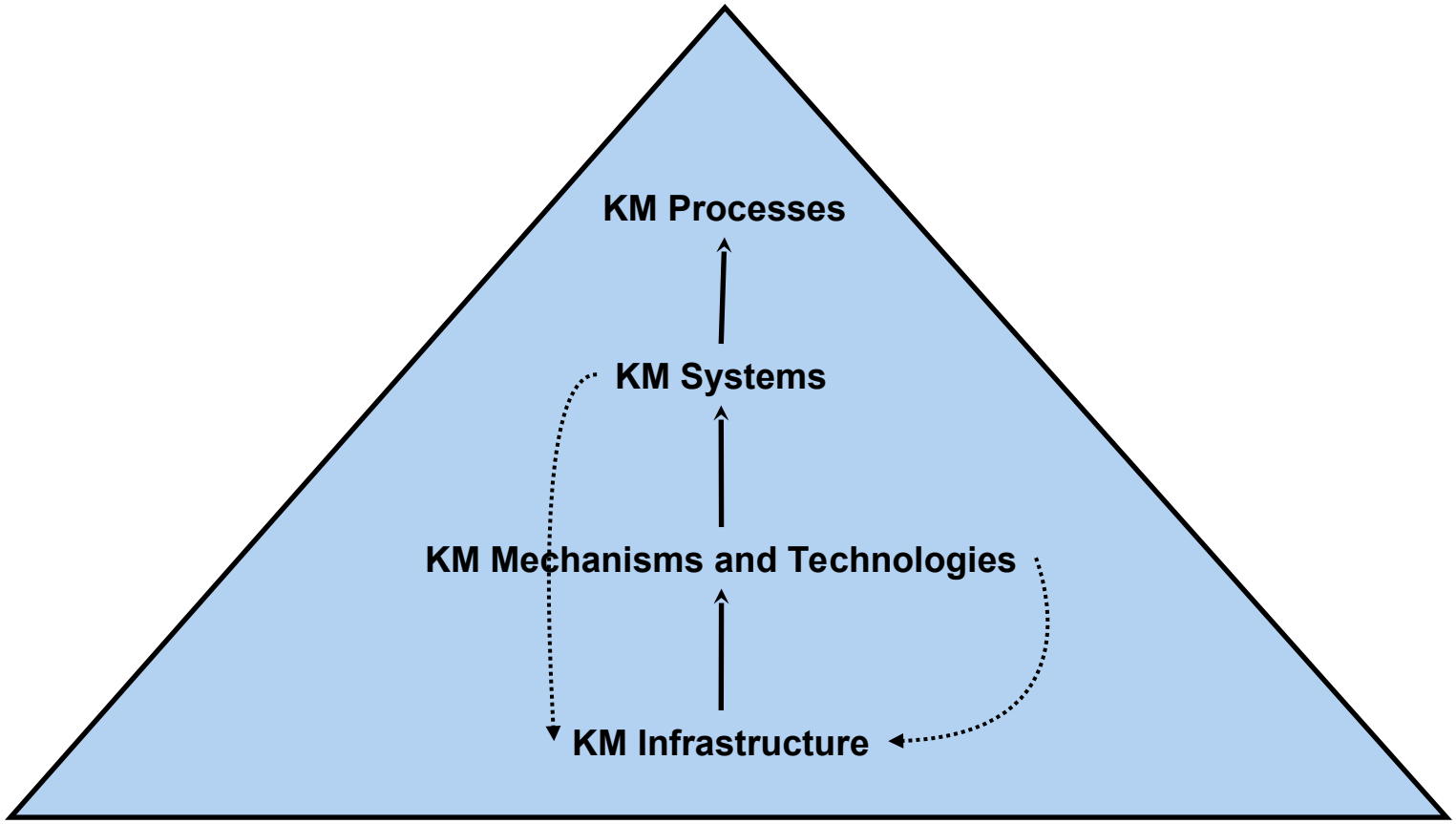
Knowledge Management Solutions

- Knowledge management solutions refer to the variety of ways in which KM can be facilitated.
- Knowledge management solutions can be divided into four broad levels:
  - KM processes
  - KM systems
  - KM mechanisms and technologies
  - KM infrastructure
- Thinking about KM *solutions* takes the broadest view – overlooking all aspects of KM.

Knowledge Management Systems

- Knowledge management systems are the integration of technologies and mechanisms that are developed to support KM processes
- (We'll consider KM systems in detail in the third part of this course.)

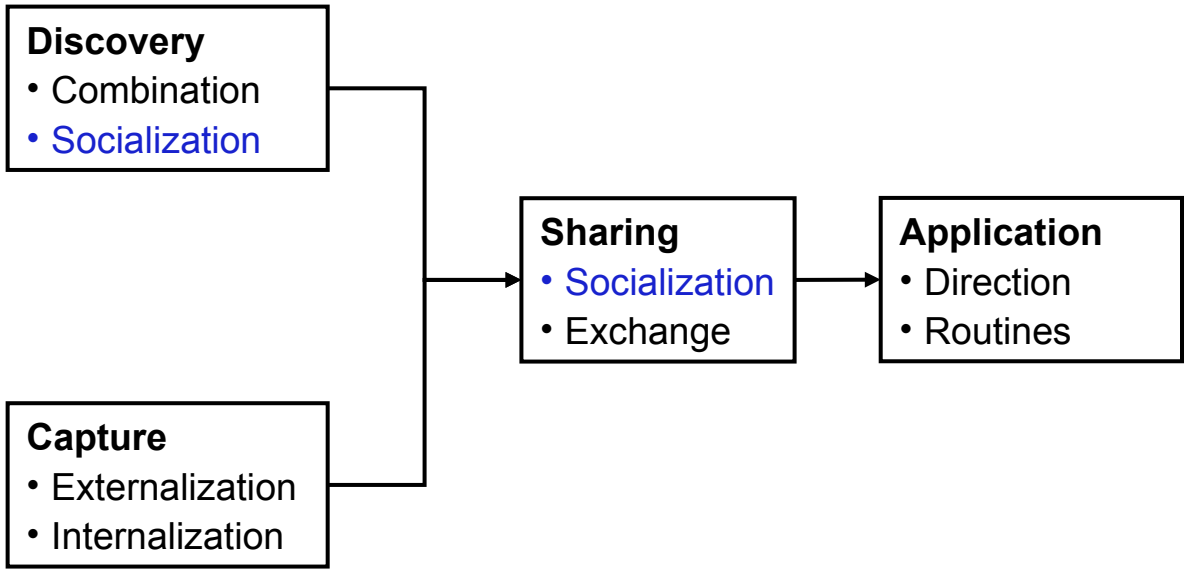
An Overview of Knowledge Management Solutions



Knowledge Management Processes

Knowledge Management Processes

- What are the *processes* that knowledge undergoes in an organization?



Nonaka's Model of Knowledge Creation & Transformation (1)

- In 1995, Nonaka coined the terms *tacit knowledge* and *explicit knowledge* as the two main types of human knowledge.
- The key to knowledge creation lies in the way it is mobilized and converted through technology.

	tacit	*explicit*
tacit	**Socialization**	**Externalization**
explicit	**Internalization**	**Combination**

Nonaka's Model of Knowledge Creation & Transformation (2)

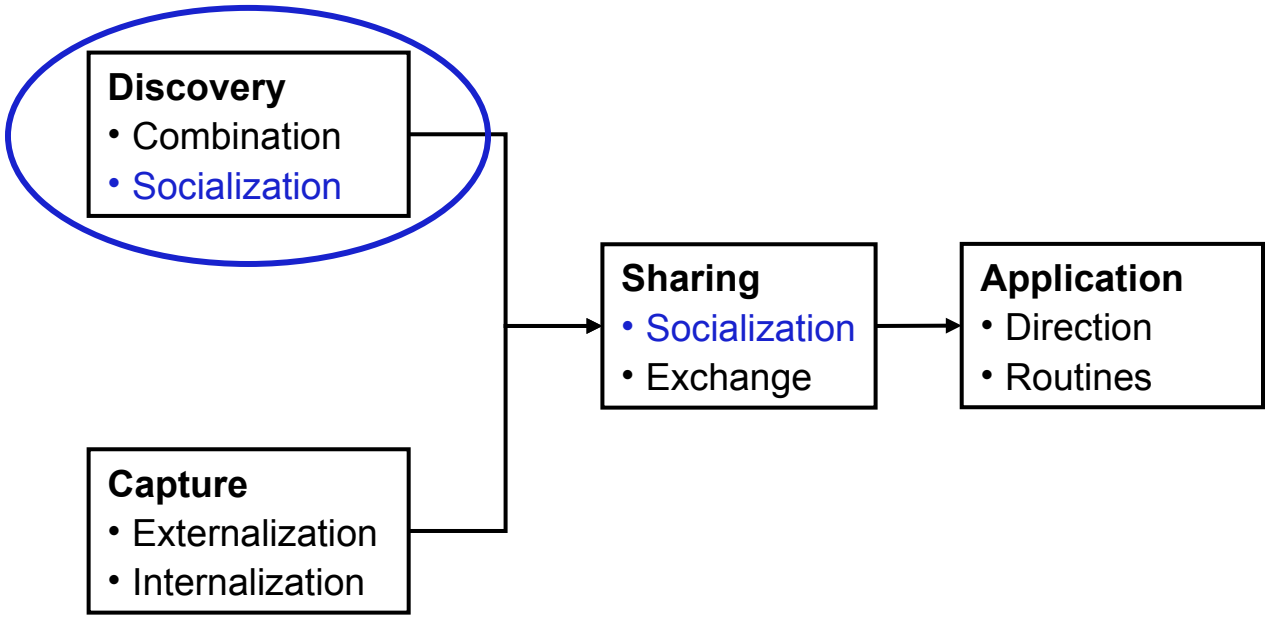
- **Tacit to tacit communication** (Socialization): Takes place between people in meetings or in team discussions.
- **Tacit to explicit communication** (Externalization): Articulation among people through dialog (e.g., brainstorming).

Nonaka's Model of Knowledge Creation & Transformation (3)

- **Explicit to explicit communication** (Combination): This transformation phase can be best supported by technology. Explicit knowledge can be easily captured and then distributed/transmitted to worldwide audience.

- **Explicit to tacit communication** (Internalization): This implies taking explicit knowledge (e.g., a report) and deducing new ideas or taking constructive action. One significant goal of knowledge management is to create technology to help the users to derive tacit knowledge from explicit knowledge.

Knowledge Management Processes



Knowledge Discovery

- Knowledge discovery may be defined as the development of new tacit or explicit knowledge from data and information or from the synthesis of prior knowledge.
- Two subprocesses are involved:
  - Combination: enabling the discovery of new explicit knowledge
  - Socialization: enabling the discovery of new tacit knowledge

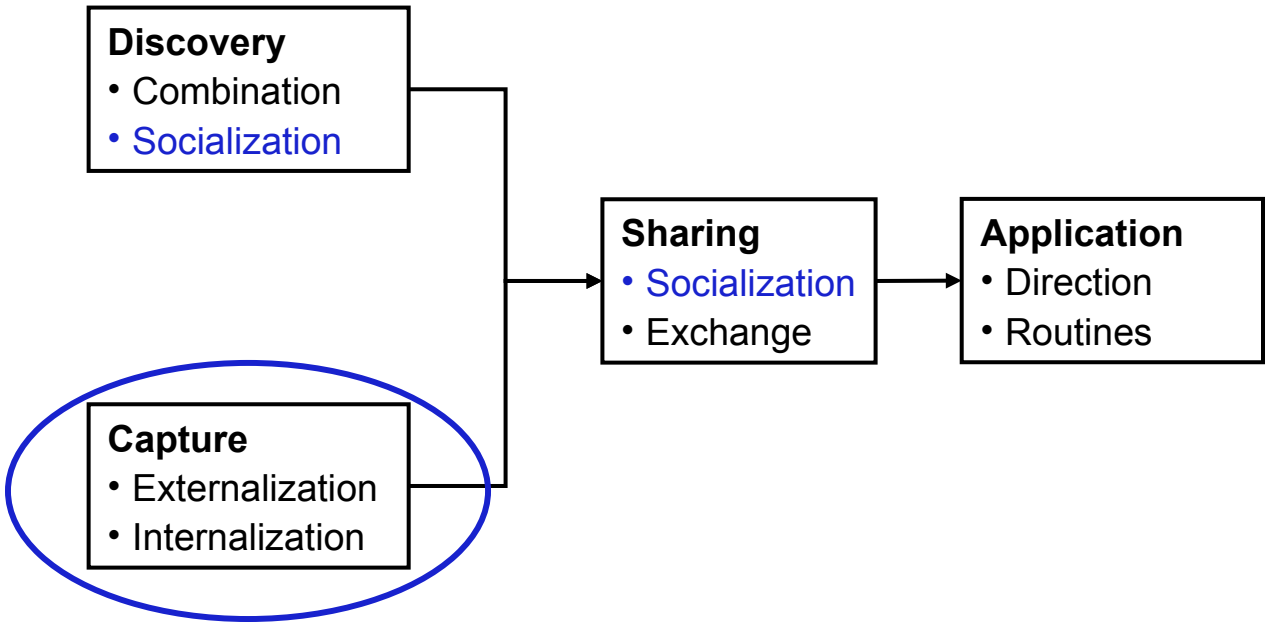
Knowledge Discovery Subprocesses: Combination

- *Combination*: multiple bodies of explicit knowledge (+ information + data) are synthesized to create new, more complex sets of explicit knowledge.
  - Happens via communication, integration, and systemization of **multiple streams of explicit knowledge**.
  - Existing explicit knowledge, information, and data are reconfigured, recategorized, and recontextualized.
- Examples:
  - To create a **new** **proposal** to a client, the explicit data, information, and knowledge embedded in **prior proposals** and **planning documents** may be combined and/or reused.
  - **Data mining** techniques may be used to uncover new relationships among explicit data, to produce **predictive** or **categorization** models that create **new** **knowledge**.

Knowledge Discovery Subprocesses: Socialization

- *Socialization*: synthesis of tacit knowledge across individuals
  - Usually happens through **joint** activities instead of written or verbal instructions.
- Examples:
  - By transferring ideas and images, apprenticeships or internships help newcomers to see **how others think**.
  - Conversations at the **watercooler** helped knowledge sharing among groups at IBM [Davenport & Prusak1998].

Knowledge Management Processes



KM Processes: Knowledge Capture

- *Knowledge capture* is defined as the process of retrieving either explicit or tacit knowledge that resides within people, artifacts, or organizational entities.
- Examples:
  - Knowledge might reside within an individual's mind, without that individual having the ability to recognize it and share it with others. (tacit knowledge)
  - Knowledge might reside in an explicit form in a manual, but few people might be aware of it. (explicit knowledge)
  - **In both cases**, it is important to obtain the knowledge such that it can be shared with others.
- Knowledge captured might reside outside the organizational boundaries, including consultants, competitors, customers, suppliers, and prior employers of the organization's new employees

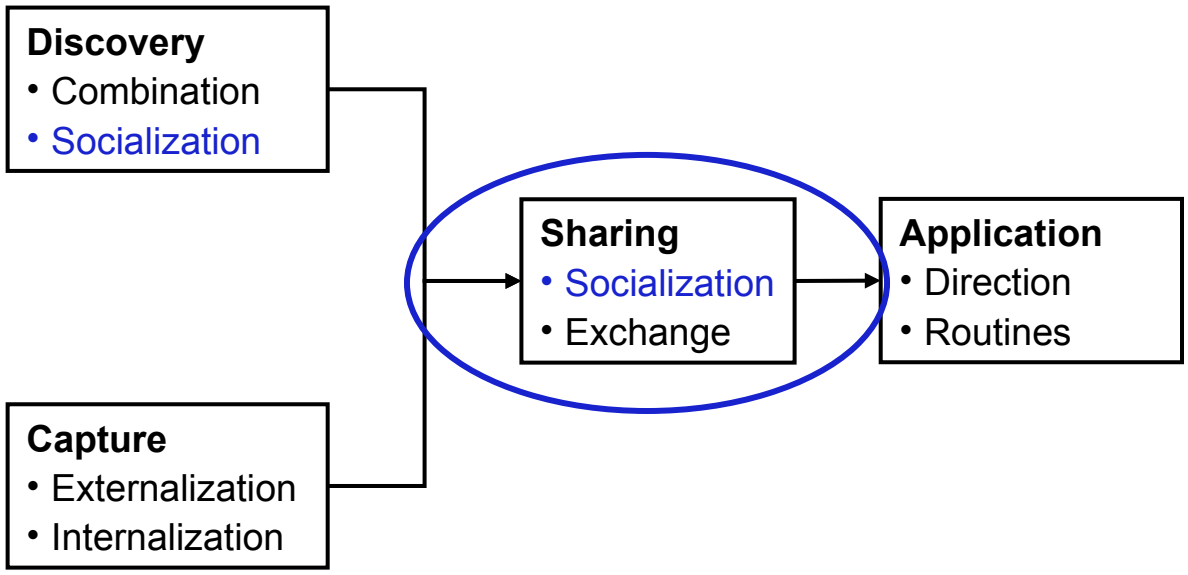
Knowledge Capture Subprocesses: Externalization

- *Externalization* involves converting tacit knowledge into explicit forms such as:
  - Words
  - concepts
  - visuals
  - figurative language (metaphors, analogies, narratives, etc.)
- Difficult process –tacit knowledge is often difficult to articulate.
- Examples:
  - **Use of metaphor**: understanding and experiencing one kind of thing in terms of another [Nonaka1994]
  - A consultant team **writing a document** that describes the **lessons** the team has **learned** by observing a client organization, executives, and approaches

Knowledge Capture Subprocesses: Internalization

- *Internalization* is the conversion of explicit knowledge into tacit knowledge.
- Represents the traditional notion of "learning".
- Explicit knowledge may be embodied in action and practice…
  - so that the individual can re-experience what others have gone through.
- Or, individuals can acquire tacit knowledge in virtual situations, either:
  - *Vicariously* by reading manuals or other's stories
    - *Vicarious:* experienced by watching or reading about someone else doing something, rather than by doing it yourself
  - *Experientially* through simulations or experiments [Nonaka& Takeuchi 1995]
- Example:
  - New software consultant reads a book on innovative software development, and learns from it.

Knowledge Management Processes



KM Processes: Knowledge Sharing

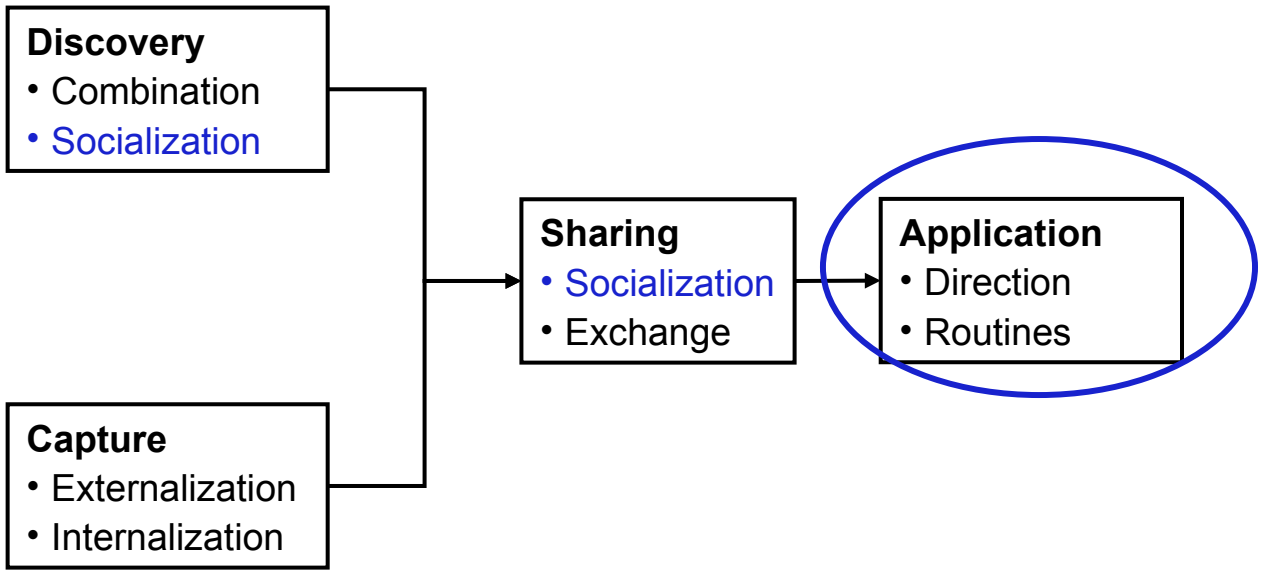
- *Knowledge sharing* is the process through which explicit or tacit knowledge is communicated to other individuals

- Must be the *knowledge* itself that is shared
  - Not just recommendations based on knowledge (which is just *utilization* rather than *sharing* of knowledge; we call this *direction* as discussed shortly)
- May take place across individuals, groups, departments or organizations

Knowledge Sharing Subprocesses: Exchange

- Recall (from Discovery):
  - *Socialization*: synthesis of tacit knowledge across individuals
  - Usually happens through joint activities instead of written or verbal instructions.
  - Also used for knowledge sharing–in addition to capture.
- *Exchange*: communication or transfer of explicit knowledge between individuals, groups, and organizations
  - Example: a product design **manual transferred** by one employee to another, who can then use the explicit knowledge contained.

Knowledge Management Processes



KM Processes: Knowledge Application

- *Knowledge application* is the process through which explicit or tacit knowledge is utilized to guide decisions and actions
- In knowledge application, the party that makes use of the knowledge does not necessarily need to comprehend it!
  - As long as the knowledge is somehow used to guide the decisions or actions –directly or indirectly
  - Knowledge application is possible even in the absence of actual exchange or transfer of knowledge…

Knowledge Application Subprocesses: Direction

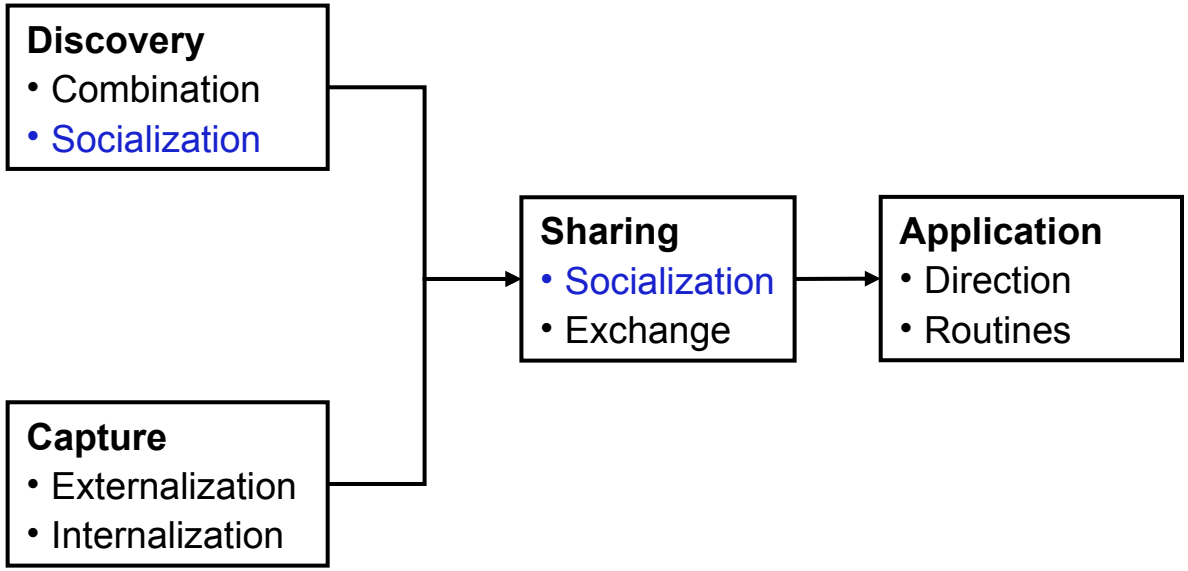
- *Direction* refers to the process through which individuals possessing the knowledge direct the action of another individual without transferring to that person the knowledge underlying the direction
- Pros:
  - Preserves the advantages of employee specialization
  - Avoids the difficulties inherent in the transfer of tacit knowledge
- Example:
  - Production worker calls experts to ask how to solve a particular problem with a machine, and then solves the problem based on instructions given by the experts
  - Note that the production worker has not acquired and internalized the expert's knowledge (unlike socialization or exchange)
- Cons:
  - If a similar problem reoccurs in the future, the production worker still could not identify and solve it without calling an expert

Knowledge Application Subprocesses: Routines

- *Routines* involve the utilization of knowledge embedded in procedures, rules, and norms that guide future behavior
- Pros:
  - Economizes on communication more than directions, because they are embedded in “mechanical” procedures:
  - bureaucratic processes
  - automated technologies
- Example:
  - An inventory management system utilizes considerable knowledge about the relationship between demand and supply –but neither the knowledge nor the directions are communicated through individuals
- Cons:
  - Takes time to develop, relying on constant repetition
  - Those utilizing the knowledge often have no understanding of the reasons underlying the procedures and rules –cannot adapt to new or unexpected cases

Group Discussion

- Break into groups of 2-3 students
- Discuss for 15 minutes what knowledge management processes you can identify in either your organization or an organization you have dealt with (brain storming).

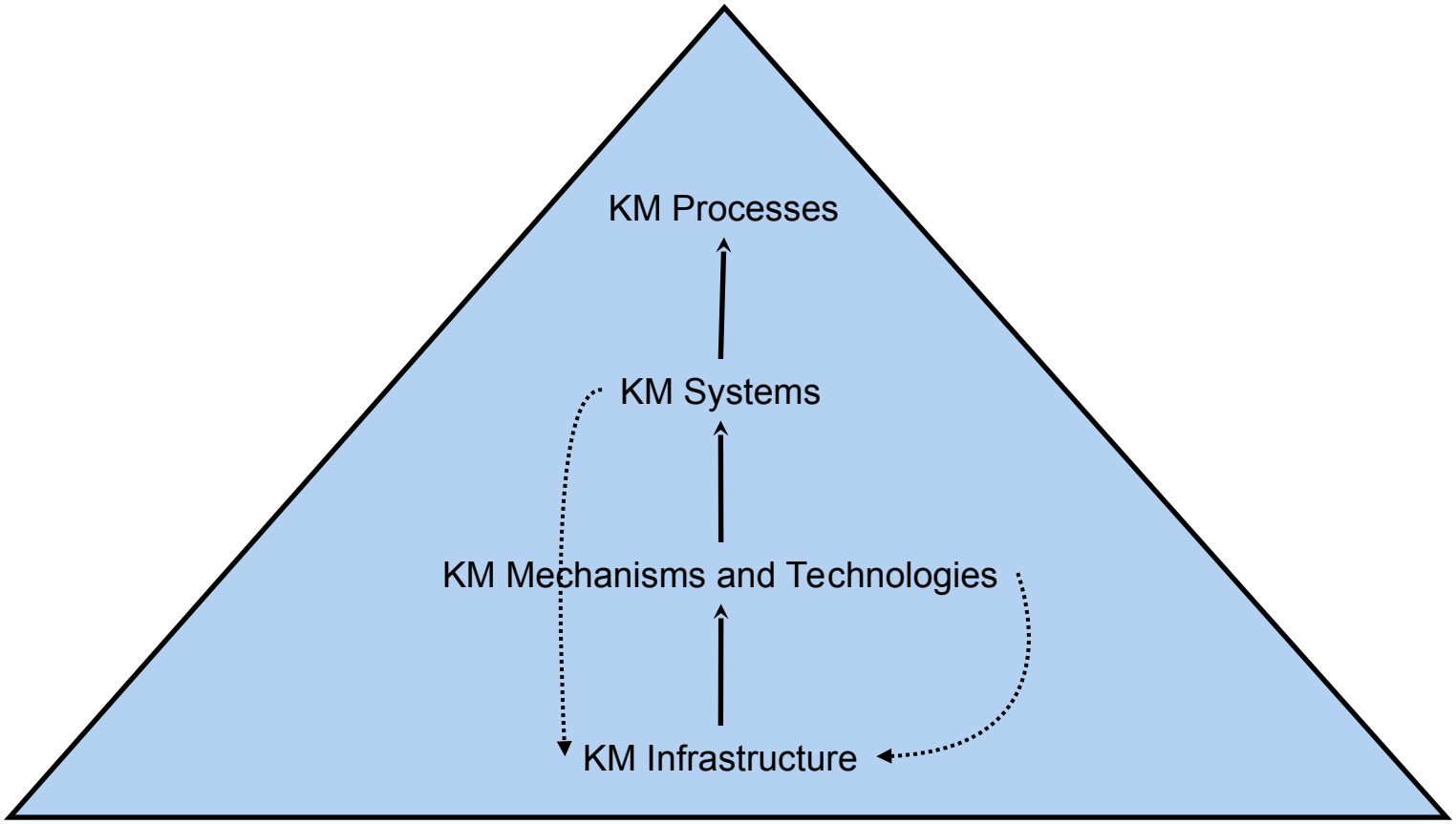


Group Discussion

- In 10 minutes, write the different processes (one sentence each)
- In 5 minutes, think about how other processes can be introduced.
- Each group will introduce themselves and pitch their ideas in 5-10 minutes.

Knowledge Management mechanisms and technologies

An Overview of Knowledge Management Solutions



Knowledge Management Mechanisms

- KM mechanisms are organizational or structural **means** used to promote KM
- KM mechanisms may or may not utilize electronic technology
- KM mechanisms involve some kind of
  - organizational arrangement, or social means, or structural means of facilitating KM
- Examples:
  - Near-term: learning by doing, on-the-job training, learning by observation, face-to-face meetings, …
  - Long-term: hiring a Chief Knowledge Officer, cooperative projects across departments, traditional hierarchical relationships, organizational policies, standards, initiation process for new employees, employee rotation across departments, …

Knowledge Management Technologies (1)

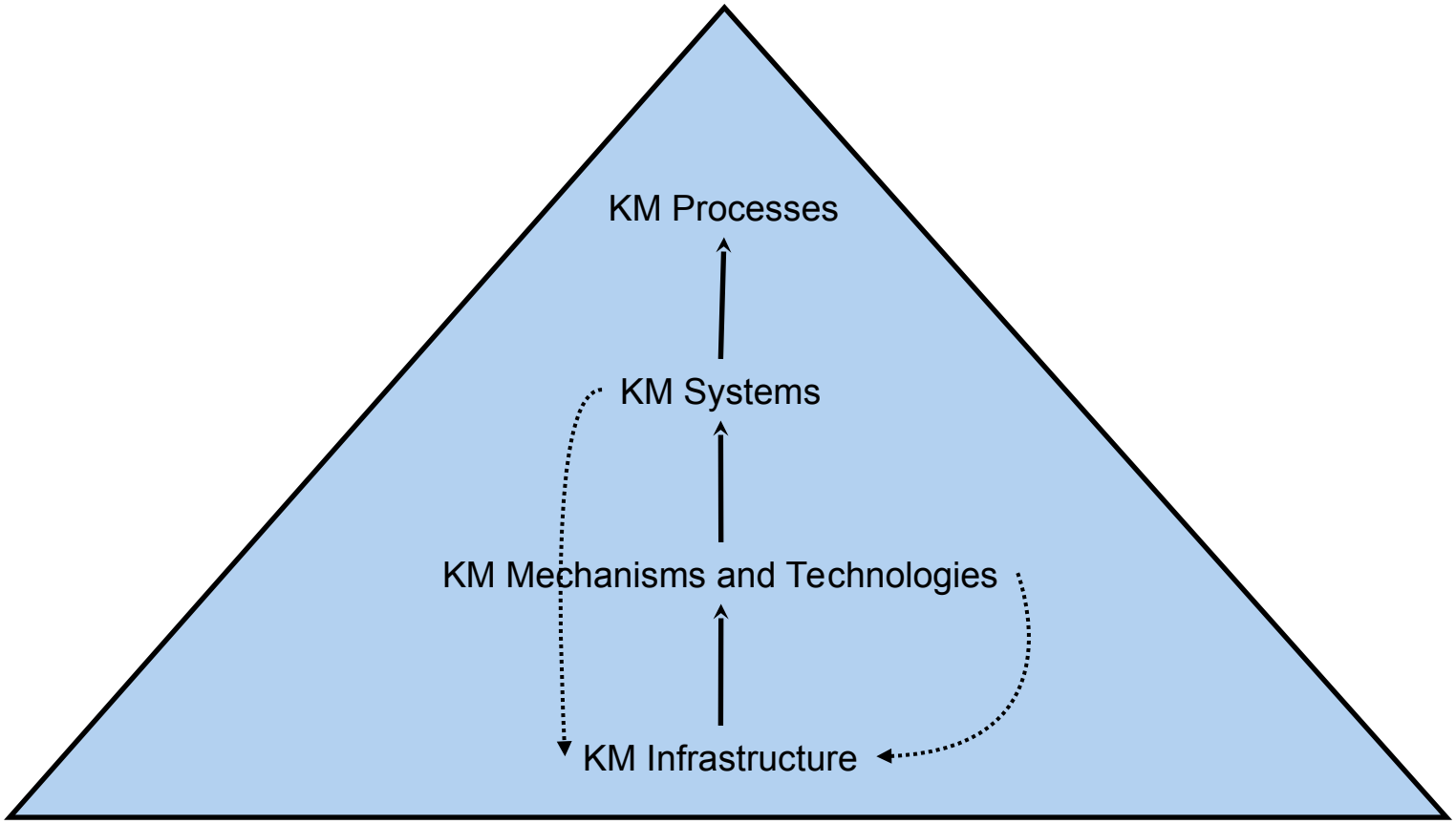
- Technologies that support KM include:
  - artificial intelligence (AI) technologies encompassing: those used for knowledge acquisition, case-based reasoning systems, expert systems, … and many others
  - electronic discussion groups
  - computer-based simulations
  - databases
  - decision support systems
  - enterprise resource planning systems
  - management information systems
  - expertise locator systems
  - videoconferencing
  - information repositories encompassing best practices databases and lessons learned systems

Knowledge Management Technologies (2)-Examples

- World Bank: uses a combination of video interviews and hyperlinks to documents and reports to systematically record the knowledge of employees who are close to retirement [Lesser & Prusak2001]
- British Petroleum (BP): desktop videoconferencing has improved communication and enabled many problems at offshore oil fields to be solved without extensive traveling [Skyrme2000]

Knowledge Management Systems

An Overview of Knowledge Management Solutions



Knowledge Management Systems

- KM systems utilize a variety of KM mechanisms and technologies in order to support the KM processes
  - Knowledge Management Discovery Systems
  - Knowledge Management Capture Systems
  - Knowledge Management Sharing Systems
  - Knowledge Application Systems

Knowledge Discovery Systems

- Knowledge discovery systems support the process of developing new tacit or explicit knowledge from data and information or from the synthesis of prior knowledge
- Support two KM sub-processes
  - Combination: enabling the discovery of new explicit knowledge.
  - Socialization: enabling the discovery of new tacit knowledge.

Knowledge Discovery Systems: Mechanisms for Combination

- Mechanisms that facilitate *combination*:
  - Collaborative problem solving
  - Joint decision making
  - Collaborative creation of documents
- Example:
  - At senior management level, new explicit knowledge is created by
    - sharing documents and information related to midrange concepts (eg, product concepts) augmented with grand concepts (eg, corporate vision) to produce new knowledge about both areas.
  - This newly created knowledge might be a better understanding of products and a corporate vision [Nonaka& Takeuchi 1995].

Knowledge Discovery Systems: Mechanisms for Socialization

- Mechanisms that facilitate *socialization*:
  - Apprenticeships
  - Employee rotation across areas (units, departments, etc.)
  - Conferences
  - Brainstorming retreats
  - Cooperative projects across departments
  - Initiation process for new employees
- Example:
  - Honda “sets up brainstorming camps (*tama dashi kai*) –informal meetings for detailed discussions to solve difficult problems in development projects” [Nonaka& Takeuchi 1995]

Knowledge Discovery Systems: Technologies for Combination

- Technologies that facilitate *combination*:
  - Knowledge discovery systems
  - Databases
  - Web-based access to data
- "Reconfiguration of existing information through sorting, adding, combining, and categorizing of explicit knowledge (as conducted in computer databases) can lead to new knowledge" [Nonaka& Takeuchi 1995].

Knowledge Discovery Systems: Technologies for Socialization

- Technologies that facilitate *socialization*:
  - Instant messaging
  - Social chat groups
  - VOIP
  - Video-conferencing
  - Electronic support for *communities of practice* (COPs)
  - Wikis
  - Forums, Blogs, newsgroups

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Knowledge Capture Systems

- Knowledge capture systems support the process of retrieving either explicit or tacit knowledge that resides within people, artifacts, or organizational entities
- Technologies can also support knowledge capture systems by facilitating externalization and internalization

Knowledge Capture Systems: Mechanisms for Externalization

- Examples of mechanisms that facilitate *externalization*, from the consulting company - Viant [Stewart 2000]:
  - Before every project, consultants are required to complete a "quick sheet" describing:
    - the knowledge they need
    - what aspects of knowledge can be leveraged from prior projects
    - what they need to create
    - the lessons they hope to learn that they can share with others later
  - After every project, the team is required to meet to produce a *sunset review* to document what worked and what did not work well.

Knowledge Capture Systems: Mechanisms for Internalization

- Mechanisms that facilitate *internalization*:
  - Learning by doing
  - On-the-job training
  - Learning by observation
  - Face-to-face meetings
- Example:
  - At one firm "the product divisions also frequently send their **new-product development people** to the *Answer Center* to **chat** with the telephone operators or the 12 specialists, thereby 're-experiencing' their experiences" [Nonaka& Takeuchi 1995].

Knowledge Capture Systems: Technologies

- Technologies that facilitate *externalization*:
  - Knowledge elicitation is needed for implementation of intelligent technologies such as:
    - expert systems (e.g. CLIPS)
    - case-based reasoning systems
- Technologies that facilitate *internalization*:
  - Computer-based training technologies
  - Communication technologies
    - eg, an individual can internalize knowledge from a message sent by another expert, an AI-based knowledge capture system, computer-based simulations, …

Knowledge Management Systems

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Knowledge Sharing Systems

- *Knowledge sharing systems* support the process through which explicit or implicit knowledge is communicated to other individuals
- Knowledge sharing systems operate by supporting socialization (which promotes sharing of tacit knowledge) and exchange (i.e., sharing of explicit knowledge) subprocesses

Knowledge Sharing Systems: Mechanisms & Technologies for Socialization

- Mechanisms and technologies facilitating *socialization* are already discussed.

Knowledge Sharing Systems: Mechanisms & Technologies for Exchange

- Mechanisms facilitating *exchange*:
  - memos & letters
  - manuals
  - progress reports
  - presentations
- Technologies facilitating *exchange*:
  - Web 2.0, groupware & other team collaboration mechanisms
  - web-based access to data & databases
  - repositories of information, including best practice databases, lessons learned systems, and expertise locator systems

Knowledge Management Systems

- KM systems utilize a variety of KM mechanisms and technologies in order to support the KM processes
  - Knowledge Management Discovery Systems
  - Knowledge Management Capture Systems
  - Knowledge Management Sharing Systems
  - Knowledge Application Systems

Knowledge Application Systems

- Knowledge application systems support the process through which some individuals utilize knowledge possessed by other individuals without actually acquiring, or learning, that knowledge
- Mechanisms and technologies support knowledge application systems by facilitating routines and direction.

Knowledge Application Systems: KM Mechanisms

- Mechanisms facilitating *direction* include:
  - traditional hierarchical relationships in organizations
  - help desks
  - support centers
- Mechanisms supporting *routines* include:
  - organizational policies
  - work practices
  - standards
- For both direction and routines, these mechanisms can be implemented either:
  - within an organization (eg, organizational hierarchies)
  - across organizations (eg, software support help desks)

Knowledge Application Systems: KM Technologies

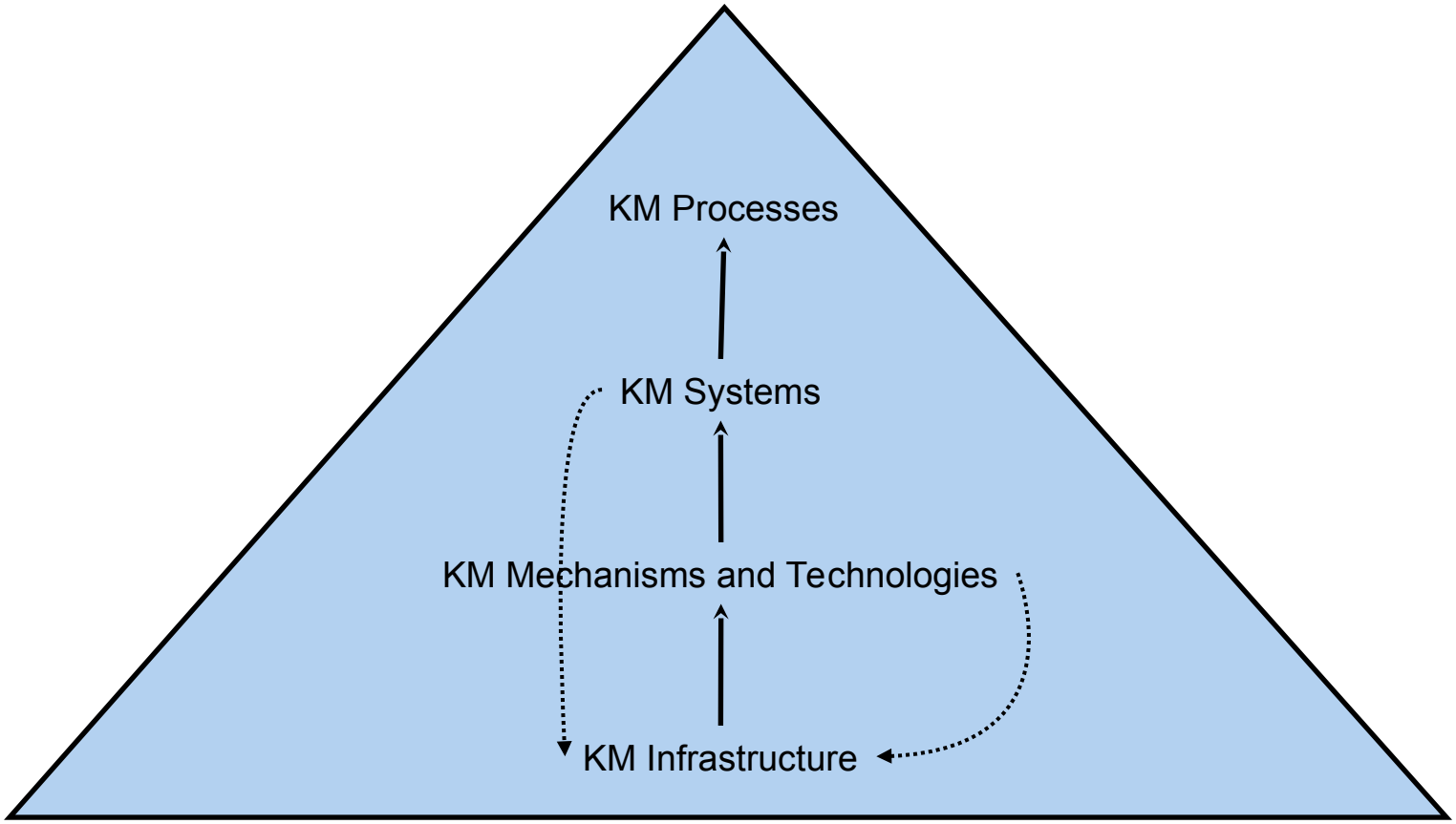
- Technologies supporting *direction* include:
  - experts' knowledge embedded in expert systems and decision support systems
  - troubleshooting systems based on the use of technologies like case-based reasoning
- Technologies that facilitate *routines* include:
  - enterprise resource planning systems
  - traditional management information systems

KM Processes, Mechanisms, and Technologies: A summary

KM Processes	KM Systems	KM Sub-Processes	Illustrative KM Mechanisms	Illustrative KM Technologies
Knowledge Discovery	Knowledge Discovery Systems	Combination	Meetings, telephone conversations, and documents, collaborative creation of documents	Databases, web-based access to data, data mining, repositories of information, Web portals, best practices and lessons learned
		Socialization	Employee rotation across departments, conferences, brainstorming retreats, cooperative projects, initiation	Video-conferencing, electronic discussion groups, e-mail
Knowledge Capture	Knowledge Capture Systems	Externalization	Models, prototypes, best practices, lessons learned	Expert systems, chat groups, best practices, and lessons learned databases.
		Internalization	Learning by doing, on-the-job training, learning by observation, and face-to-face meetings	Computer-based communication, AI-based knowledge acquisition, computer-based simulations
Knowledge Sharing	Knowledge Sharing Systems	Socialization	See above	See above
		Exchange	Memos, manuals, letters, presentations	Team collaboration tools, web-based access to data, databases, and repositories of information, best practices databases, lessons learned systems, and expertise locator systems
Knowledge Application	Knowledge Application Systems	Direction	Traditional hierarchical relationships in organizations, help desks, and support centers	Capture and transfer of experts' knowledge, troubleshooting systems, and case-based reasoning systems; decision support systems
		Routines	Organizational policies, work practices, and standards	Expert systems, enterprise resource planning systems, management information systems

Knowledge Management Infrastructure

An Overview of Knowledge Management Solutions



Knowledge Management Infrastructure: components

- 5 main components:
  - Organizational Culture
  - Organizational Structure
  - Information Technology Infrastructure
  - Common Knowledge
  - Physical Environment

KM Infrastructure: Organizational Culture

- *Organizational culture* reflects the norms and beliefs that guide the behavior of the organization's members
- Attributes of a KM-enabling organizational culture include:
  - Management support for KM at all levels, including allocation of time and adequate funding resources
  - Incentives that reward knowledge sharing, and encouragement of interaction for the creation and sharing of knowledge

KM Infrastructure: Organizational Culture Obstacles

- Typically, the most important challenges in KM are nontechnical in nature –and have to do with lack of the above organizational culture characteristics [Dyer and McDonough 2001].
- Less than 10% of companies trying to implement KM have succeeded in making it part of their culture [estimate by Carla O'Dell, as reported by Koudsi 2000].

KM Infrastructure: Organizational Structure (1)

- *Hierarchical structure* of the organization affects the people with whom individuals frequently interact, and to or from whom they are consequently likely to transfer knowledge
  - Traditional reporting relationships influence:
    - the flow of data and information
    - the groups who make decisions together
    - and thus, the sharing and creation of knowledge
  - By decentralizing or flattening the organizational structure, companies often seek to eliminate organizational layers, so as to:
    - place more responsibility with each individual
    - increase the size of groups reporting to each individual
    - and thus, increase likelihood of knowledge sharing across a larger group of individuals

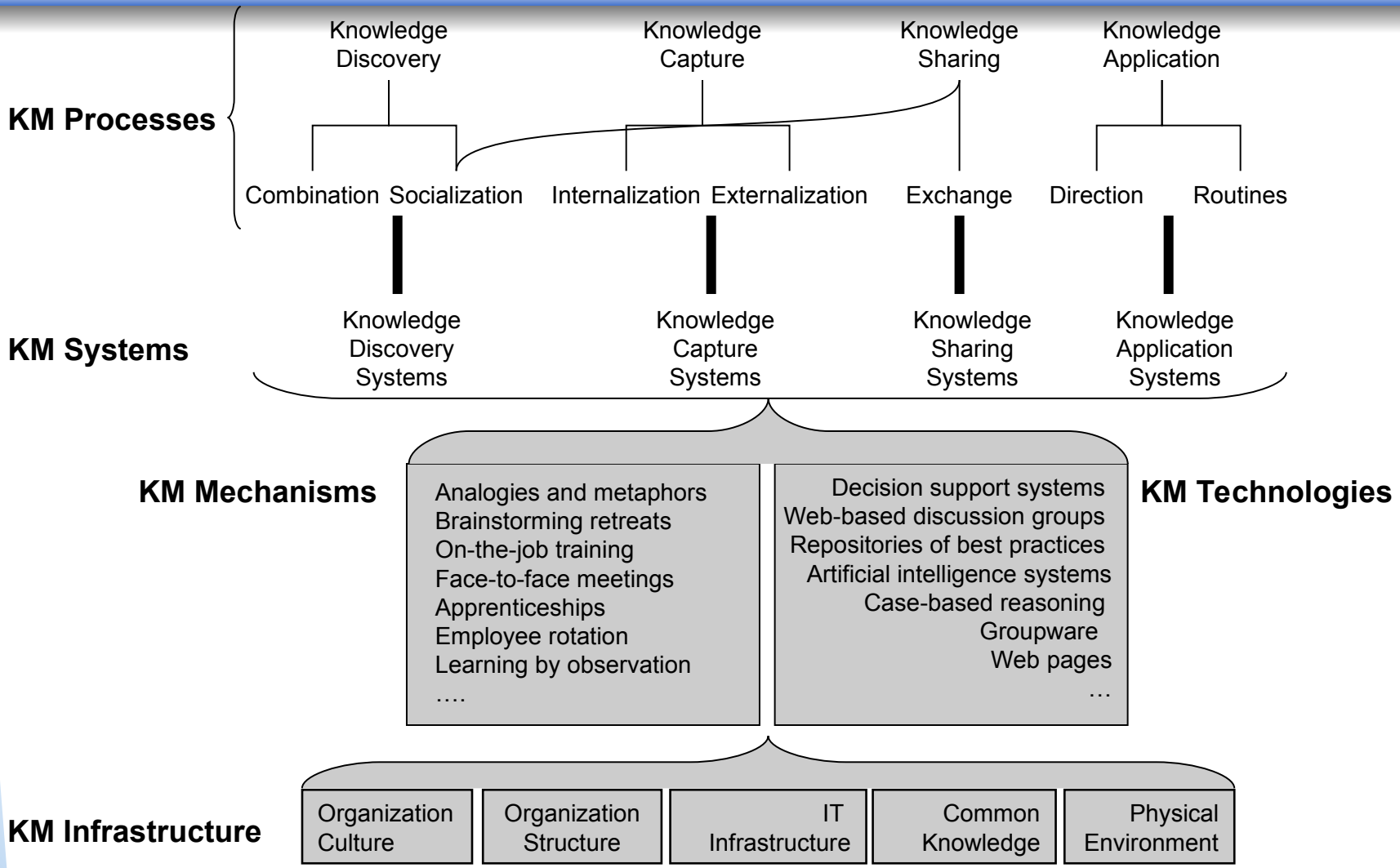
KM Infrastructure: Organizational Structure (2)

- Organizational structures can facilitate KM through *communities of practice*
- *A community of practice* (COP) is an organic and self-organized group of individuals who are dispersed geographically or organizationally but communicate regularly to discuss issues of mutual interest [Lave & Wenger 1991].
- Examples:
  - A tech club at DaimlerChrysler includes a group of engineers who do not work in the same unit but meet regularly, on their own initiative, to discuss problems related to their area of expertise
  - At Xerox, a strategic community of IT professionals, involving frequent informal interactions among them, promotes knowledge sharing [Storck& Hill 2000]

KM Infrastructure: IT Infrastructure

- The IT infrastructure includes data processing, storage, and communication technologies and systems
- One way of systematically viewing the IT infrastructure is to consider the capabilities it provides in four important aspects [Daft & Lengel1986; Evans & Wurster1999]:
  - Reach: access and connection
  - Depth: detail and amount of information that can be effectively communicated over a medium
  - Richness: rich of communication
  - Aggregation: of large volumes of information drawn from multiple resources

Overview of Knowledge Management Solutions



Conclusions

- Described the key aspects of knowledge management
- Provided a working definition of knowledge management
- Examined knowledge management solutions at four levels
  - KM processes
  - KM systems
  - KM mechanisms and technologies
  - KM infrastructure

Group Discussion-cont'd

- In 20 minutes, For each group:
  - Discuss for each process strengths and weaknesses of your organization's KM, with respect to the mechanisms and technologies as well as the infrastructure.
- In 15 minutes, write your conclusion (one sentence each)
- Each group will introduce themselves and pitch their ideas in 10 minutes.

Week 3: Chapter 3

Knowledge Management Solutions