# Module 2
# Knowledge Management

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# Topics

- KM Cycle: Process, Models of KM cycle
- Knowledge creation and knowledge architecture
- capturing tacit Knowledge

# KM Cycle

- Effective knowledge management requires an organization to identify, generate, acquire, diffuse, and capture the benefits of knowledge that provide a strategic advantage to that organization.
- A knowledge management cycle can be perceived as the route information follows in order to become transformed into a valuable strategic asset for the organization via a knowledge management cycle.

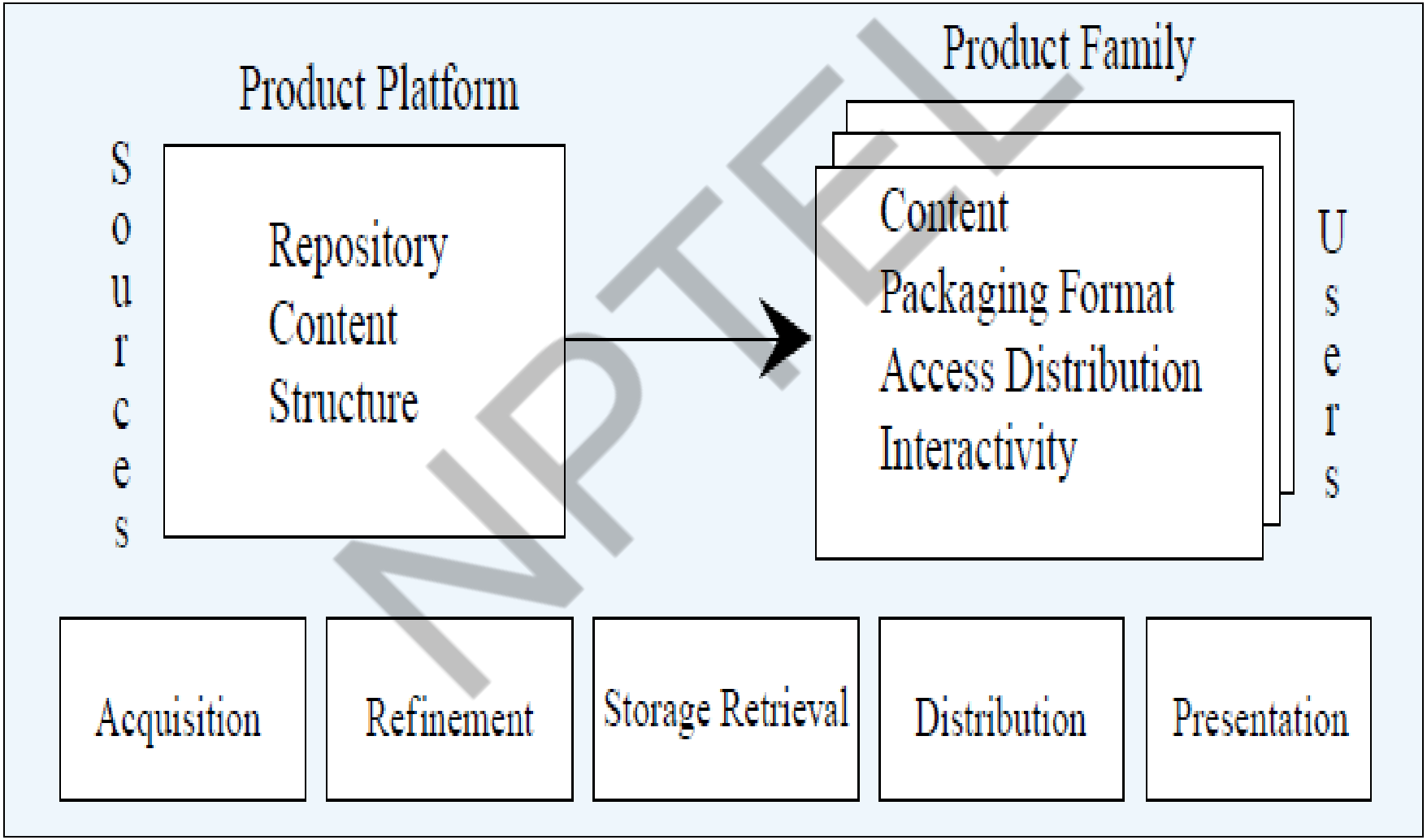
# KM Cycle Processes

- Knowledge Capture
- Knowledge Creation
- Knowledge Codification
- Knowledge Sharing
- Knowledge Access
- Knowledge Application
- Knowledge Re-Use

# *Meyer and Zack KM Cycle*

- KM cycle processes are composed of technologies, facilities and processes of manufacturing products and services.
- Information products are repositories comprising information content and structure, which is unique for each organization.
- Information Content is the data held in the repository that provides the building blocks for the resulting information products such as **Banks have content relating to Personal and commercial accounts**
- The major developmental stages of a knowledge repository and mapped these stages onto a KM cycle.

# Meyer and Zack KM Cycle



# *Meyer and Zack KM Cycle (1)*

- Acquisition deals with issues regarding origin of raw materials such as scope, breadth, depth, credibility, accuracy, timeliness, relevance, cost, control, and exclusivity.
- The guiding principle is that, highest quality source data is required, else the intellectual products produced downstream will be lower.

# Stage 2

- Refinement may be physical (like migrating from one medium to another) or logical (like restructuring, relabeling, indexing, and integrating).
- Refining includes cleaning up (like sanitizing content so as to ensure complete anonymity of sources and key players involved) or standardizing (like conforming to templates of a best practice or lessons learned as used within that particular organization.
- This stage also adds up to the value by creating more readily usable knowledge objects and by storing the content more flexibly for future use.

# Stage 3 and 4

- Storage or Retrieval forms a bridge between the upstream addition and refinement stages that feed the repository and downstream stages of product generation. Storage can be physical (file folders, printed information) as well as digital (database, knowledge management software).
- Distribution defines how the product is to be delivered to the end-user (like fax, print, email) and encloses not only the medium of delivery but also its timing, frequency, form, language, and so on.

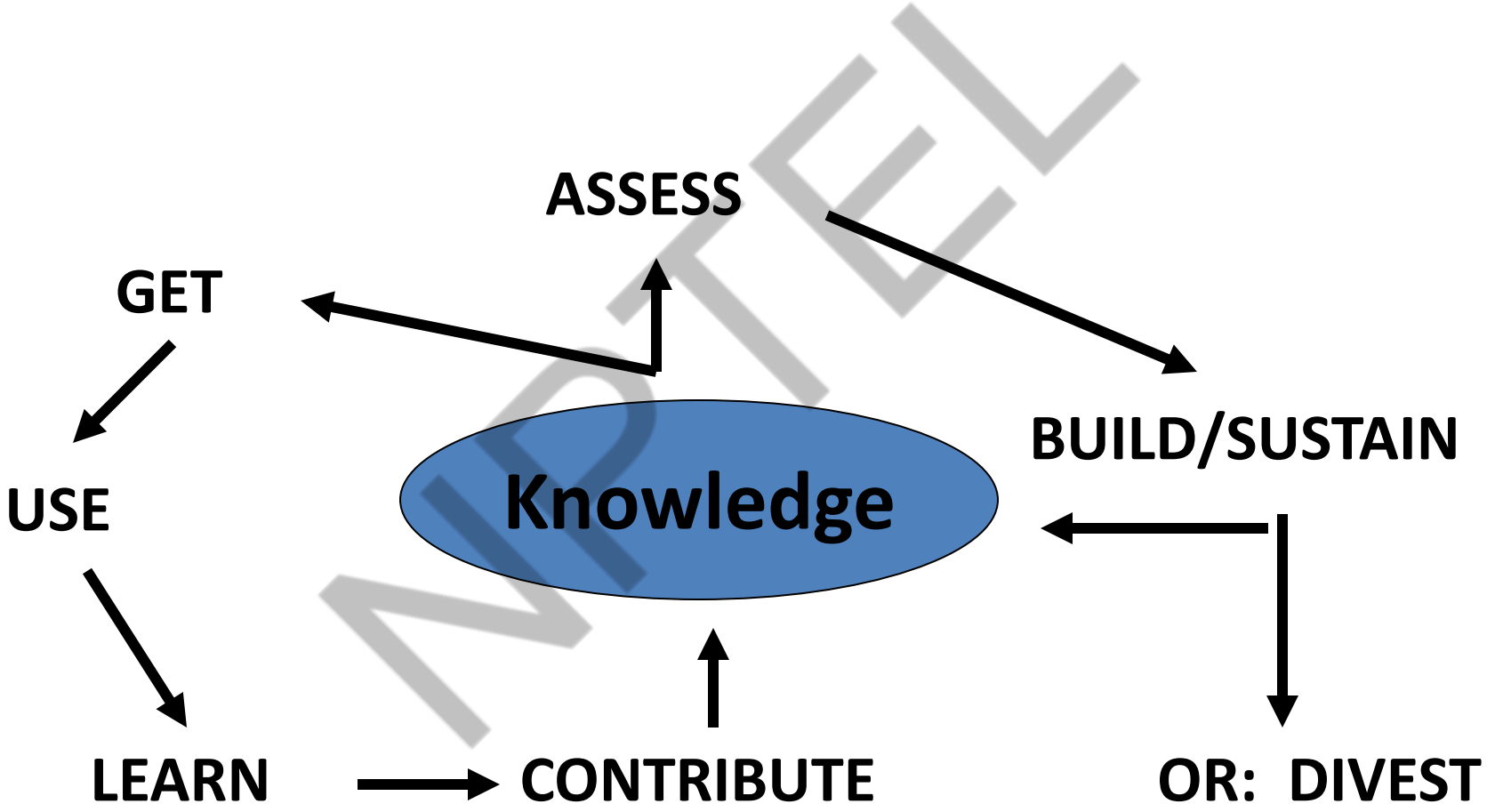
# Stage 5: **Presentation**

- Context plays an important role in Presentation or Application stage. The performance of each of the preceding value-added steps is evaluated here – for example, does the user have enough context to be able to make use of this content?
- If not, the KM cycle has failed to deliver value to the individual and ultimately to the company.
- Example: A **Basic Database** may represent an example of **Knowledge** that has been created. Value can then be added by extracting **Trends** from this data.
- The original information has been repackaged to provide **Trend** analyses that can serve as the basis for **Decision Making** within an organization

# Bukowitz & Williams Model

- Bukowitz and Williams portray a knowledge management process framework that outlines "*how organizations generate, maintain and expand a strategically correct stock of knowledge to create value".*
- In this framework, knowledge includes *knowledge repositories, relationships, information technologies, communications infrastructure, functional skill sets, process know-how, environmental responsiveness, organizational intelligence, and external sources*.

# Bukowitz and Williams



# Bukowitz and Williams /2

- **Get**: seeking out information
  - Tacit and explicit
  - Being selective when faced with information overload
- **Use**: combine content in new and interesting ways to foster innovation in the organization
- **Learn**: learning from experiences
  - Creation of an organizational memory

# Bukowitz and Williams/3

- **Contribute**: motivate employees to post what they have learned to a knowledge base
  - Link individual learning and knowledge to organizational memory
- **Assess**: evaluation of knowledge capital: Identify assets, metrics to assess them and link these directly to business objectives

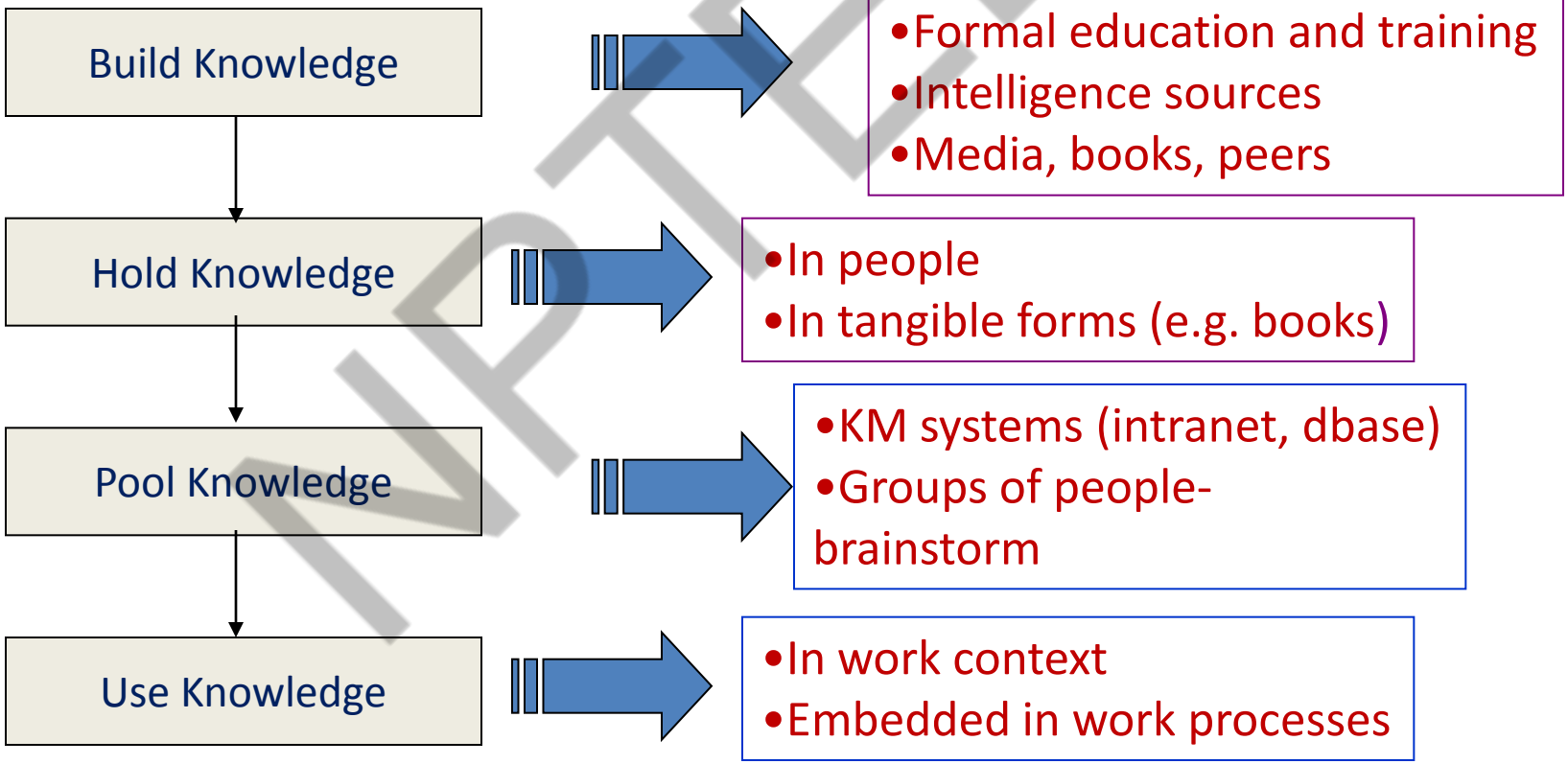
# Bukowitz and Williams/4

- **Build and Sustain**: allocate resources to maintain knowledge base
  - Contribute to viability, competitiveness
- **Divest**: should not keep assets that are no longer of any business value
  - Transfer outside the organization e.g. outsourcing
  - Patent, spin off companies etc.

# Wiig KM Cycle

- Processes by which we build and use knowledge
  - As individuals
  - As teams (communities)
  - As organizations
- How we:
  - Build knowledge
  - Hold knowledge
  - Pool knowledge
  - Apply knowledge
- Discrete tasks yet often interdependent & parallel

# Wiig KM Cycle/2



# Building Knowledge

- Learning from all kinds of sources to:
  - Obtain Knowledge
  - Analyze Knowledge
  - Reconstruct (Synthesize) Knowledge
  - Codify and Model Knowledge
  - Organize Knowledge

# Holding Knowledge

- In people's minds, books, computerized knowledge bases, etc.
  - Remember knowledge – internalize it
  - Cumulate knowledge in repositories (encode it)
  - Embed knowledge in repositories (within procedures)
  - Archive knowledge
    - Create scientific library, subscriptions
    - Retire older knowledge from active status in repository (e.g. store in another medium for potential future retrieval – cd roms, etc.)

# Pooling Knowledge

- Can take many forms such as discussions, expert networks and formal work teams
- Pooling knowledge consists of:
  - Coordinating knowledge of collaborative teams
  - Creating expert networks to identify who knows what
  - Assembling knowledge – background references from libraries and other knowledge sources
  - Accessing and retrieving knowledge
    - Consult with knowledgeable people about a difficult problem, peer reviews, second opinions
    - Obtain knowledge directly from a repository – advice, explanations

# Pooling Knowledge - Examples

- An employee realizes he or she does not have the necessary knowledge and know-how to solve a particular problem
- (S)he contact others in the company who have had similar problems to solve, consults the knowledge repository and makes use of an expert advisory system to help her out
- She organizes all this information and has subject matter experts validate the content

# Using Knowledge (con't)

- Synthesize alternative solutions, identify options, create new solutions
- Evaluate potential alternatives, appraise advantages and **disadvantages of each, determine risks and benefits of each**
- **Use knowledge to decide what to do, which alternative to select**
  - **Rank alternatives & test the extent of feasiblity, and acceptablity**
- **Implement selected alternative**
  - **Choose and assemble tools needed**
  - **Prepare implementation plan, distribute it, authorize team to proceed with this solution**

# Using Knowledge - Examples

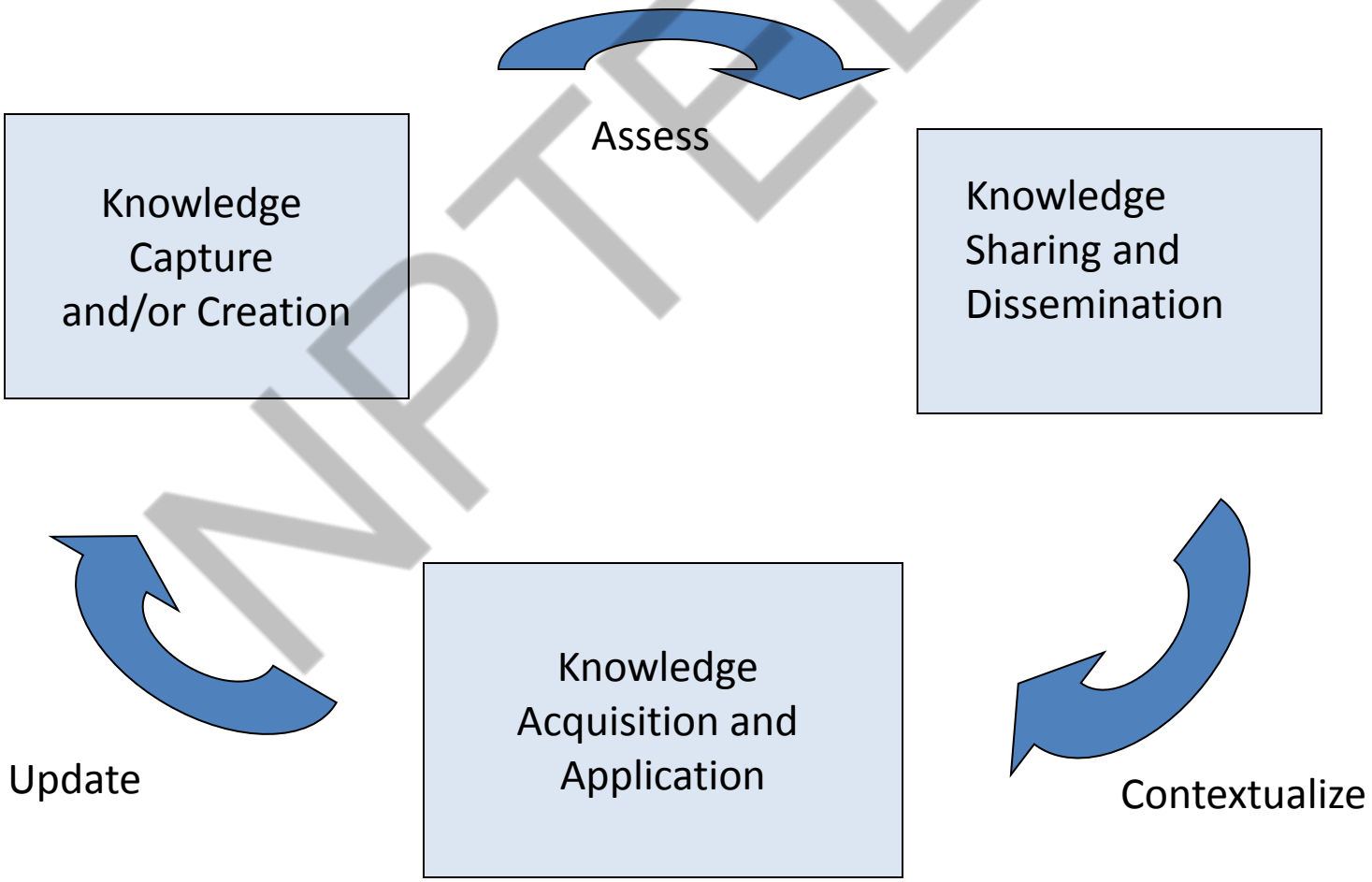
- Expert mechanic encounters a new problem
- Gathers info to diagnose and analyze
- Synthesizes a list of possible solutions with the tools he knows are available to him
- Decides on the best option and uses it to fix the part
- Non-routine tasks are approached in a different way than familiar, standard ones

# Five Critical Knowledge Functions for each KM Cycle Step

- Type of knowledge or skill involved
  - Securities trading expertise
- Business use of that knowledge
  - Increase the value of a retirement fund portfolio
- Constraint that prevents knowledge from being fully utilized
  - Expert will retire at the end of the year with no successor
- Opportunities, alternatives to manage that knowledge
  - Elicit and codify knowledge before person retires
- Expected value-added of improving the situation
  - Valuable knowledge is not lost to organization

# Integrated KM Cycle

Source: Dalkir (2005). Knowledge Management in Theory and Practice.

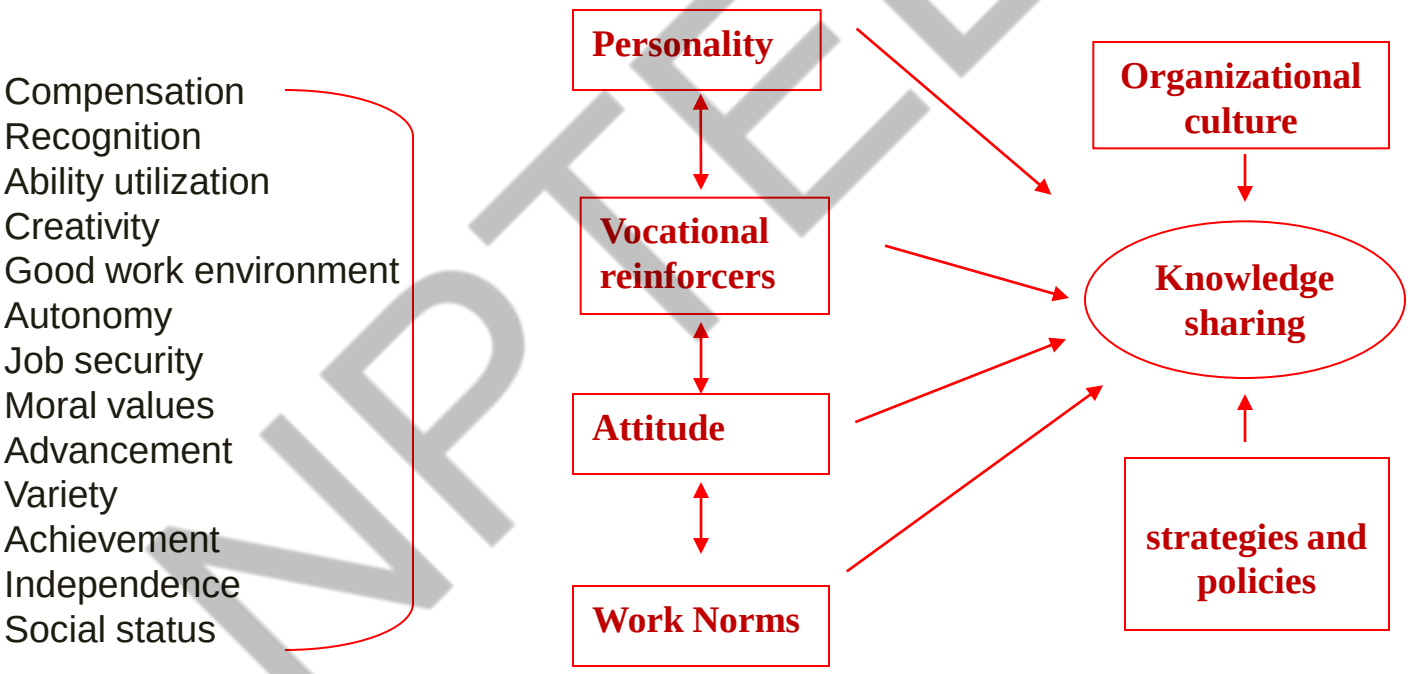


# KNOWLEDGE CREATION AND ARCHITECTURE

# KNOWLEDGE CREATION

- KM is not a technology; it is an activity enabled by technology and produced by people
- An alternative way of creating knowledge is via teamwork
- A team compares job experience to job outcome—translates experience into knowledge
- Such newly acquired knowledge is carried to the next job
- Maturation over time with a specific job turns experience into expertise

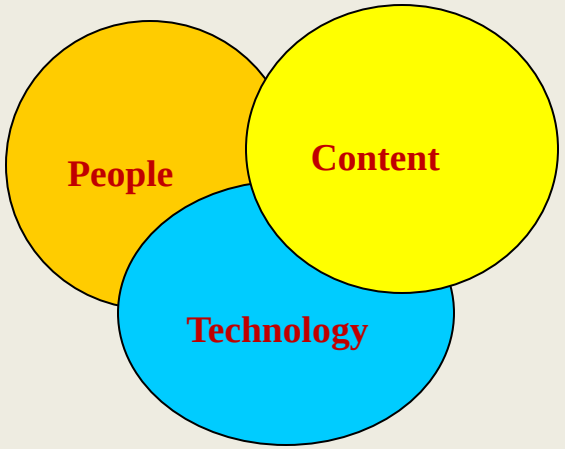
# Impediments to knowledge sharing



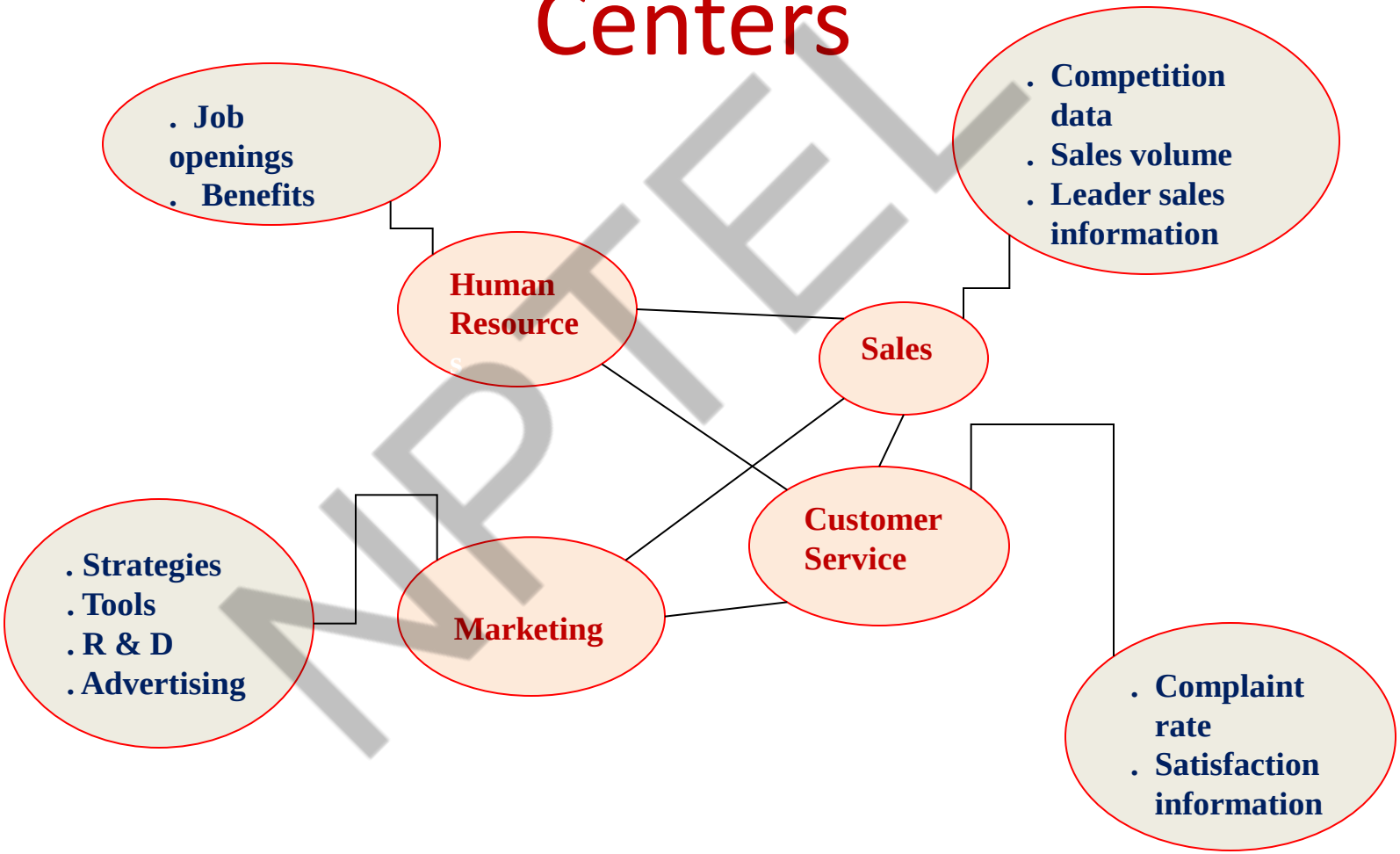

Source: Awad, E.M & Ghaziri , H (2007). Knowledge Management

# KNOWLEDGE ARCHITECTURE

- People core:  Evaluate current documents people use
- Identify knowledge centers
- The technical core:  The total technology required to operate the knowledge environment



# Identifying Knowledge Content Centers




Source: Awad, E.M & Ghaziri , H (2007). Knowledge Management

# Technical layer of the KM system

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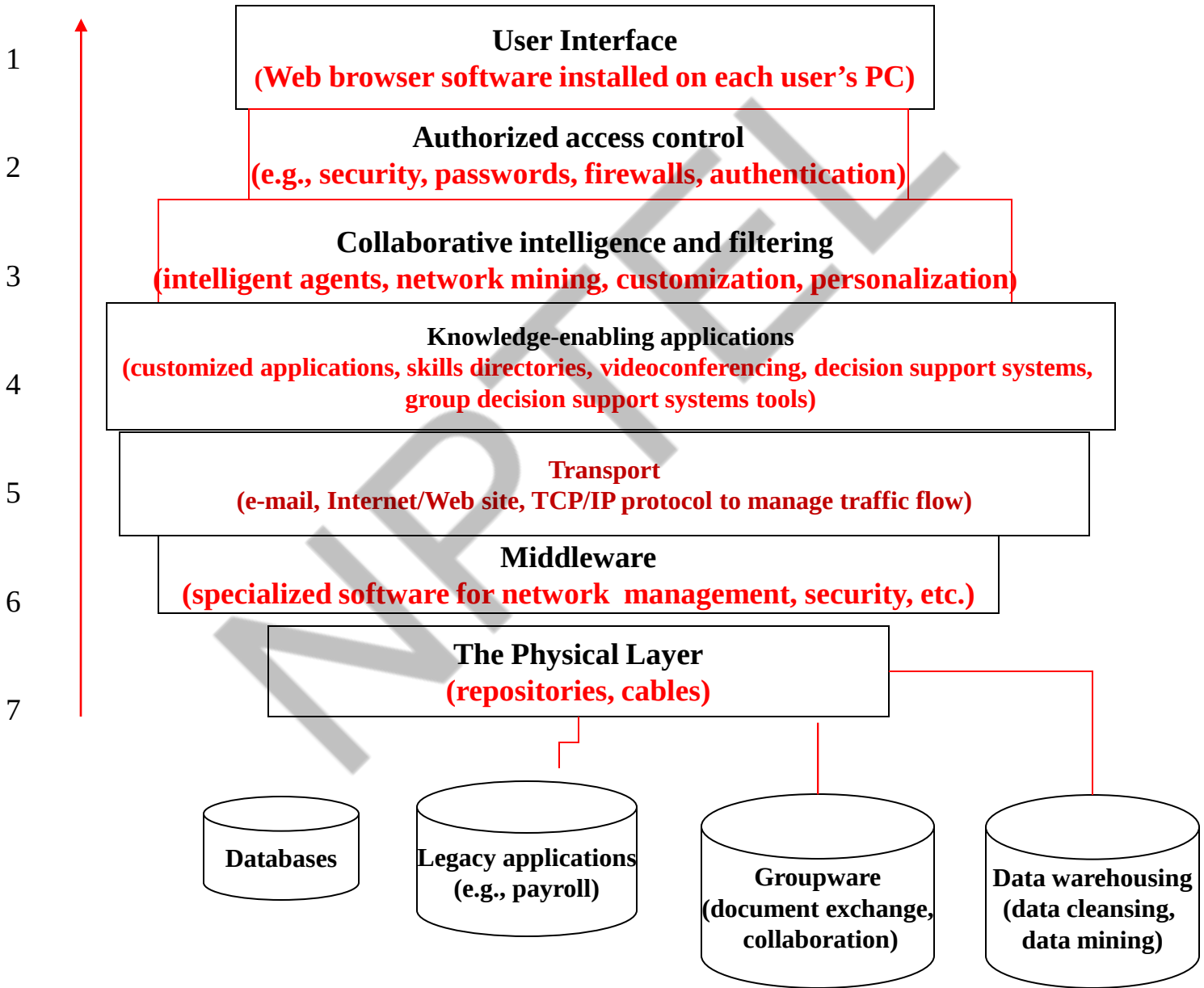


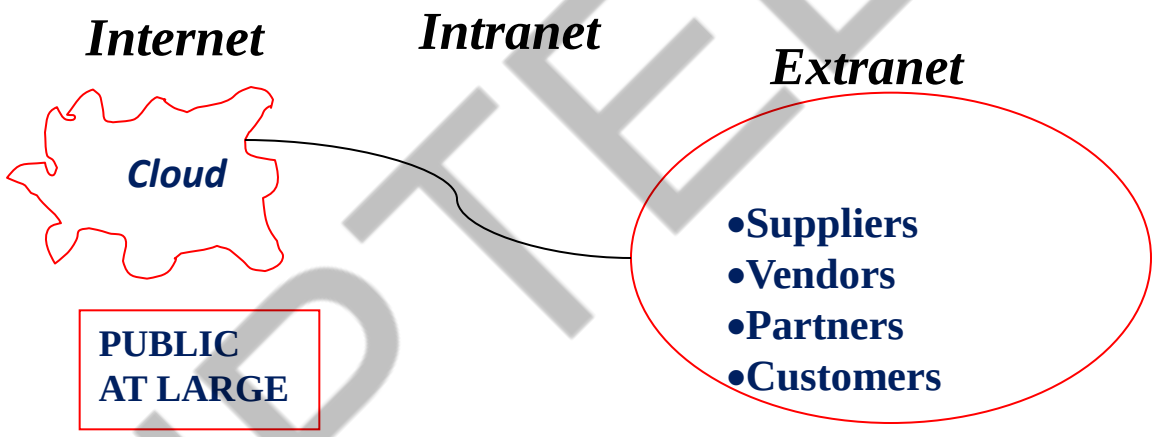
# The User Interface Layer

- Tacit knowledge should be made available face-to-face, e-mail, or by other media
- User interface design focuses on *consistency, relevancy, visual clarity, navigation, and usability*

# Technical Access Layer

- *Intranet*: The internal network of communication systems modified around the Internet
- *Extranet*: An intranet with extensions that allow clearly identified customers or suppliers to reach company-related technical educational information.

# Technical Access Layer




- News/events
- Marketing
- E-commerce
- Careers

- information
- Production information
- Sales information

- Product information
- Sales information
- Collaboration/cooperation

Source: Awad, E.M (2007). Knowledge Management

# Features/Limitations of Firewalls

Protects against:

- E-mail services known to be problems
- *Unauthorized interactive log-ins from outside firm*
- *Undesirable material coming in/leaving firm*
- *Unauthorized sensitive information leaking*

*Limitations include:*

- *Attacks that do not go through the firewall*
- *Weak security policies*
- *Viruses on floppy disks*
- *Traitors or disgruntled employees*

# *Collaborative Intelligence and Filtering Layer (Layer 3)*

- Provides personalized views based on stored knowledge
- Reduces search time for information
- Intelligent agents search across servers to find the information requested by the client (user)
- Intelligent agents arrange meetings, pay bills, and even wander through virtual shopping malls, suggesting gifts and so on

# Criteria for an Effective Collaborative Layer

- **Security—very critical**
- **Portability across platforms**
- **Integration with existing systems**
- **Scalability, flexibility, and ease of use**

# Expert Systems

- Emulate the reasoning of a human expert in a problem domain
- Can help a person become wiser, not just better informed

Components include:

- **Justifier**: explains how and why an answer is given
- **Inference engine**: problem-solving mechanism for reasoning and inferencing
- **Scheduler**: coordinates and controls rule processing

# Knowledge-Enabling Application Layer

- Often referred to as *value-added layer*
- Creates a competitive edge for the learning organization
- Provides knowledge bases, discussion databases, sales force automation tools, imaging tools, etc.
- Ultimate goal: show how knowledge sharing could improve the lot of employees

# Transport Layer

- Most technical layer to implement
- Ensures that the company will become a network of relationships
- Includes LANs, WANs, intranets, extranets, and the Internet
- Considers multimedia, URLs, graphics, connectivity speeds, and bandwidths

# Middleware Layer

- Focus on interfacing with legacy systems and programs residing on other platforms
- Designer should address databases and applications with which KM system interfaces
- Contains a cluster of programs to provide connections between legacy applications and existing systems
- Makes it possible to connect between old and new data formats

# Repositories Layer

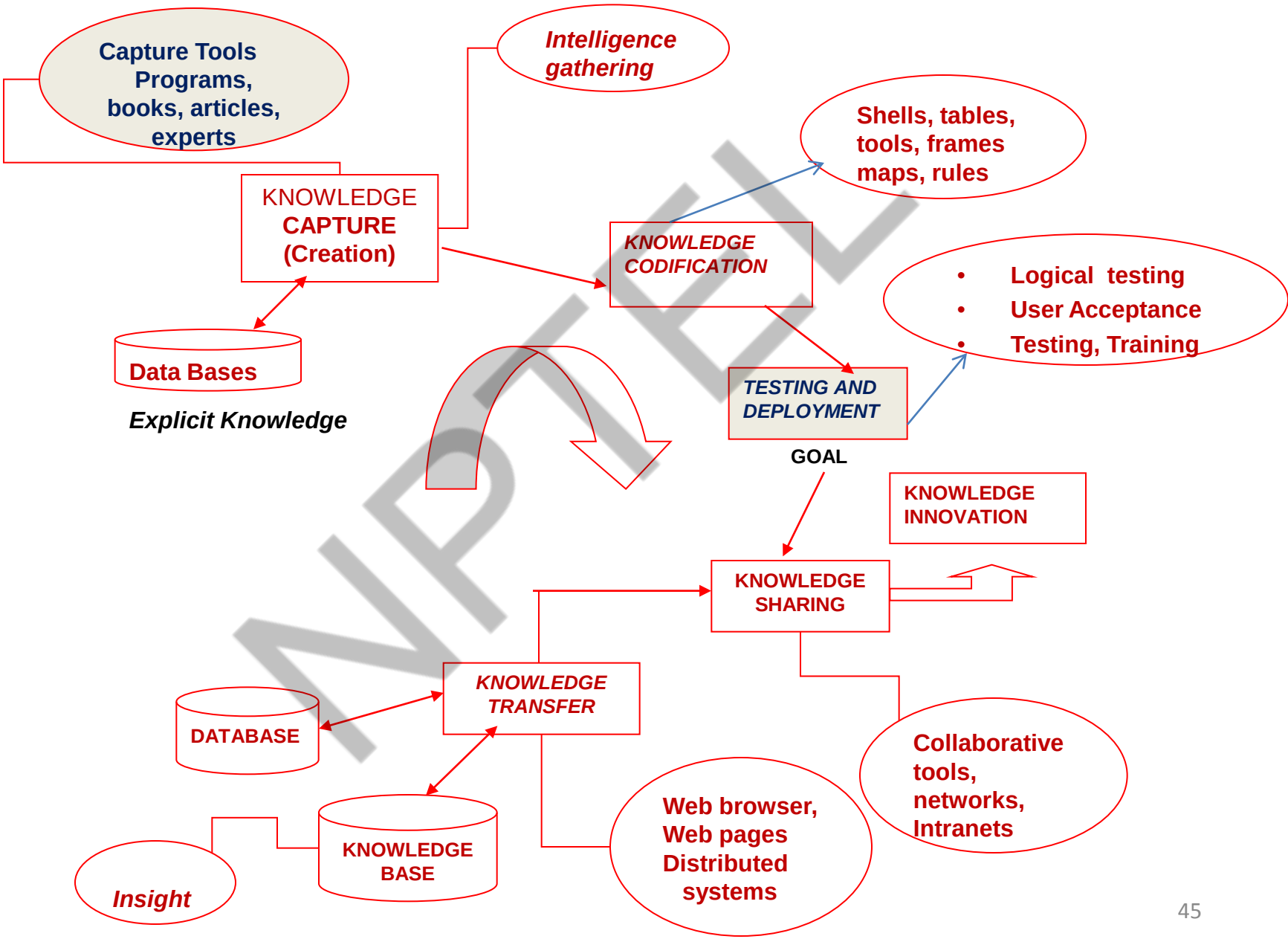
- Bottom layer in the KM architecture
- Represents the physical layer where repositories are installed
- Includes intelligent data warehouses, legacy applications, operational databases, and special applications for security and traffic management

# Build In-House, Buy, or Outsource?

- Trend is toward ready-to-use, generalized software packages
- Outsourcing is also a trend, releasing technological design to outsiders
- Regardless of choice, it is important to set criteria for the selection
- Question of who owns the KM system should be seriously considered

# CAPTURING TACIT KNOWLEDGE VARIOUS TECHNIQUES

# Knowledge Codification in the KM System Life Cycle

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# What Is Knowledge Capture ?

- Transfer of problem-solving expertise from some knowledge source to a repository or a program
- A process by which the expert's thoughts and experiences are captured- mind automation
- Includes capturing knowledge from other sources such as books, technical manuscripts, etc.
- A knowledge developer collaborates with an expert to convert expertise into a coded program
- Knowing how experts know what they know

# Steps involved

- **Knowledge capturing** is a demanding process in which knowledge developer collaborates with the experts to convert expertise into a coded program. It include three steps-

1. Use of appropriate tools to get information from the expert
2. Interpreting the information and inferring the experts knowledge and reasoning process
3. Using the interpretation to build the rules that represent the expert's though process or solution

# Improving the Knowledge Capture Process

- Knowledge developers should focus on how experts approach a problem. They must Look beyond the facts or the heuristics
- Re-evaluate how well knowledge developers understand the problem domain and how accurately they are modeling it.
- Elicit the expert knowledge through case situation and scenarios.

# Indicators of Expertise

- **Experts are distinguished by the quantity and quality of knowledge they possess.**
- **They know more and what they know makes them more efficient and effective.**
- **Peers regard expert's decisions good decisions**
- **Every time there is a problem, the expert is consulted**
- **Expert sticks to the facts and works with a focus**
- **Expert has a knack for explaining things**
- **Expert exhibits an exceptional quality in explanations**

# Expert's Qualifications

- **Knows when to follow hunches and when to make exceptions**
- **Sees big picture**
- **Possesses good communication skills**
- **Tolerates stress**
- **Thinks creatively**
- **Exhibits self-confidence**
- **Maintains credibility**
- **Operates within a schema-driven orientation**
- **Uses chunked knowledge**
- **Generates motivation and enthusiasm**
- **Shares expertise willingly**
- **Emulates a good teacher's habits**

# Pros and Cons of Using a Single Expert

Advantages:

- Ideal when building a simple KM system
- A problem in a restricted domain
- Facilitates the logistics aspect of coordinating arrangements for knowledge capture
- Problem-related or personal conflicts are easier to resolve
- Shares more confidentiality with project-related information than does multiple expert

# Pros and Cons of Using a Single Expert (cont'd)

Drawbacks:

- The expert's knowledge is not easy to capture
- Single experts provide a single line of reasoning, which makes it difficult to evoke in-depth discussion of the domain
- Single experts more likely to change scheduled meetings than experts who are part of a team
- Expert knowledge is sometimes dispersed

# Pros and Cons of Using Multiple Experts

Advantages

- Complex problem domains benefit from the expertise of more than one expert
- Working with multiple experts stimulates interaction
- Listening to a variety of views allows knowledge developer to consider alternative ways of representing knowledge
- Formal meetings frequently a better environment for generating thoughtful contributions

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# Pros and Cons of Using Multiple Experts (cont'd)

Drawbacks:

- Scheduling difficulties
- Disagreements frequently occur among experts
- Confidentiality issues
- Requires more than one knowledge developer
- Process loss in determining a solution

# Developing a Relationship With Experts

- **Create the right impression-** Knowledge developer must learn quickly and se behavioral ad technical skills to gain experts attention and respect.
- **Do not underestimate the expert's experience-** understand the experts style: procedure type, storyteller type, godfather type or salesperson type
- **Prepare well for the session-** Knowledge developer should know about the background of experts
- **Decide where to hold the session-** location and meeting places should be quiet and interruption free

# Styles of expert's expressions

- Procedure type—methodical approach to the solution
- Storyteller—focuses on the content of the domain at the expense of the solution
- Godfather—compulsion to take over the session
- Salesperson—spends most of the time explaining his or her solution is the best

# Approaching Multiple Experts

- Individual approach—holding a session with one expert at a time
- Primary and secondary experts—start with the senior expert first, on down to others in the hierarchy. Alternatively, start bottom up for verification and authentication of knowledge gathered
- Small groups approach—experts gathered in one place to provide a pool of information. Each expert tested against expertise of others in the group

# Analogies and Uncertainties In Information

- Experts use analogies to explain events
- An expert's knowledge is the ability to take uncertain information and use a plausible line of reasoning to clarify the fuzzy details
- Understanding experience. Knowledge in cognitive psychology is helpful background
- Language problem. Reliable knowledge capture requires understanding and interpreting expert's verbal description of information, heuristics, and so on

# The Interview As a Tool

- Commonly used in the early stages of tacit knowledge capture
- The voluntary nature of the interview is important
- Major benefit is behavioral analysis
- Interviewing as a tool requires training and preparation
- Great tool for eliciting information about complex subjects
- Convenient tool for evaluating the validity of information acquired
- Types of Interview: Structured, semi-structured, and unstructured

# Variations of Structured Questions

- Multiple-choice questions offer specific choices, faster tabulation, and less bias by the way answers are ordered
- Dichotomous (yes/no) questions are a special type of multiple-choice question
- Ranking scale questions ask expert to arrange items in a list in order of their important or preference

# Things to Avoid

- Taping a session without advance permission from the expert
- Converting the interview into an interrogation
- Interrupting the expert
- Asking questions that put the domain expert on the defensive
- Losing control of the session
- Pretending to understand an explanation when you actually don’t
- Promising something that cannot be delivered
- Bring items not on the agenda

# Sources of Error that Reduce Information Reliability

- Expert's perceptual slant
- Expert's failure to remember just what happened
- Expert's fear of the unknown
- Communication problems
- Role bias

Errors made by Knowledge developer- Age, Race, Gender

# Problems Encountered During the Interview

- Response bias
- Inconsistency
- Communication difficulties
- Hostile attitude
- Standardized questions
- Lengthy questions
- Long interview

# Issues to Assess

- How would one elicit knowledge from experts who cannot say what they mean or mean what they say?
- What does one say or do when the expert says, “Look, I work with shades of gray reasoning. I simply look at the problem and decide. Don’t ask me why or how.”
- How does one set up the problem domain when one has only a general idea of what it should be?
- What does one do if the relationship with the domain expert turns out to be difficult?
- What happens if the expert dislikes the knowledge developer?

# On-Site Observation

- Process of observing, interpreting, and recording problem-solving behavior while it takes place
- More listening than talking
- Some experts do not like to be observed
- Fear of ‘giving away’ expertise is a concern by the one observed
- Process can be distracting to others in the setting
- Continuous shuttle process important

# Brainstorming

- Unstructured approach to generating ideas about a problem
- All possible solutions considered equally
- Emphasis is on frequency of responses during the session
- Idea generation, followed by idea evaluation
- Computer-aided approach to dealing with multiple experts

# Protocol Analysis(Cases or Scenarios)

- Think-aloud method
- Expert keeps talking, speaking out loud while solving a problem
- Effective source of information on cognitive processes
- Makes expert cognizant of the processes being described
- Provides wealth of information toward knowledge representation

# Consensus Decision Making

- Clear agreement regarding the best solution to a problem
- As a tool, it follows brainstorming
- Procedure ensures fairness and standardization in the way experts arrive at a consensus
- A bit tedious and can take hours
- The rigidity of the consensus method can be a problem for many experts

# The Repertory Grid

- Domain expert viewed as a scientist who categorizes a problem domain using his or her own model
- Grid used to capture and evaluate the expert's model
- Experts see problems based on reasoning that has stood test of time
- A representation of the experts' way of looking at a particular problem
- A grid is a scale or a bipolar construct on which elements are placed within gradations
- Novice ——————————————— Expert

# The Repertory Grid (cont'd)

- Benefit:  May prompt the expert to think more seriously about the problem and how to solve it.
- Drawback:  Difficult to manage when large grids are accompanied by complex details
- Because of difficulty in simplicity and manageability, the tool is normally used in the early stages of knowledge capture

# Nominal Group Technique (NGT)

- Mitigates the process losses associated with multiple experts
- An alternative to the consensus technique
- Provides an interface between consensus and brainstorming
- Panel of experts becomes a “nominal” group whose meetings structured in order to effectively pool individual judgment
- An idea writing or idea generation technique

# NGT (cont'd)

- Effective in multiple expert knowledge capture, especially when minimizing differences in status among experts is important
- In NGT, each expert has an equal chance to express ideas in parallel with other experts in the group
- With discussion accommodated in sequential order, NGT can be a more efficient and productive approach than brainstorming

# Delphi Method (cont'd)

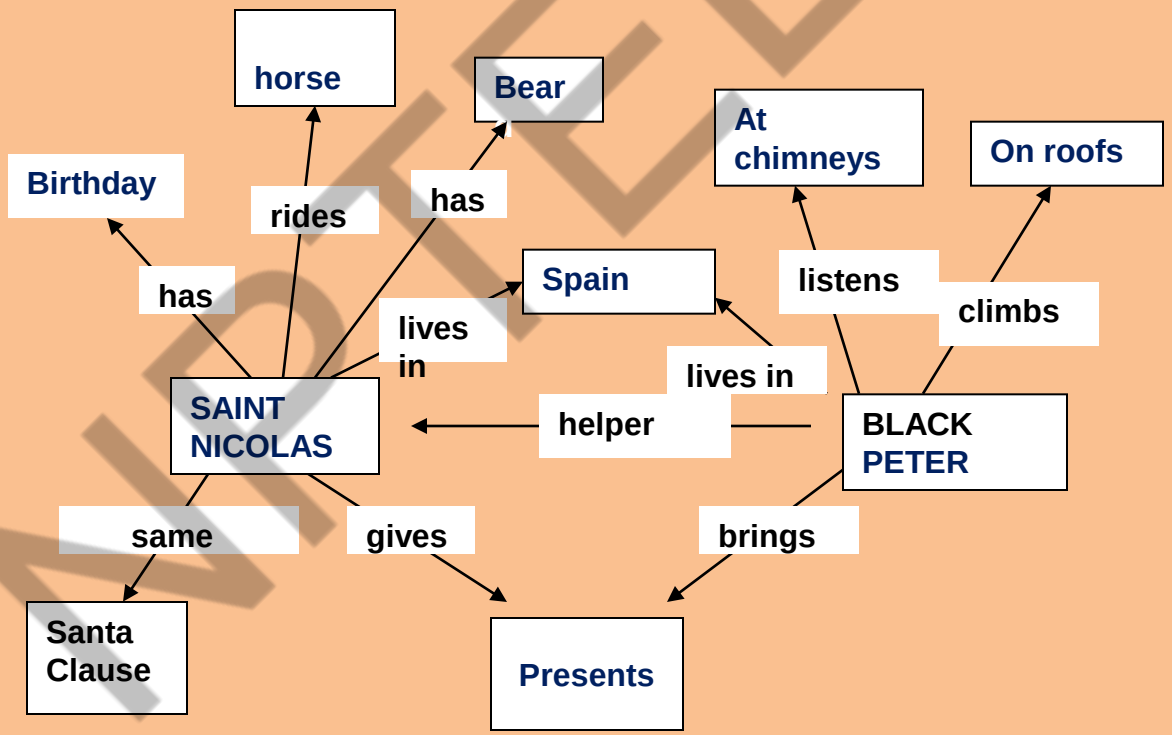
- Controlled feedback
- Statistical group response
- Experts often lack necessary knowledge on which to base final judgment
- Poorly designed questionnaire could cause all kinds of problems

# Concept Mapping

- A network of concepts, consisting of nodes and links
- A node represents a concept and a link represents the relationship between concepts. An effective way for a group to function without losing their individuality

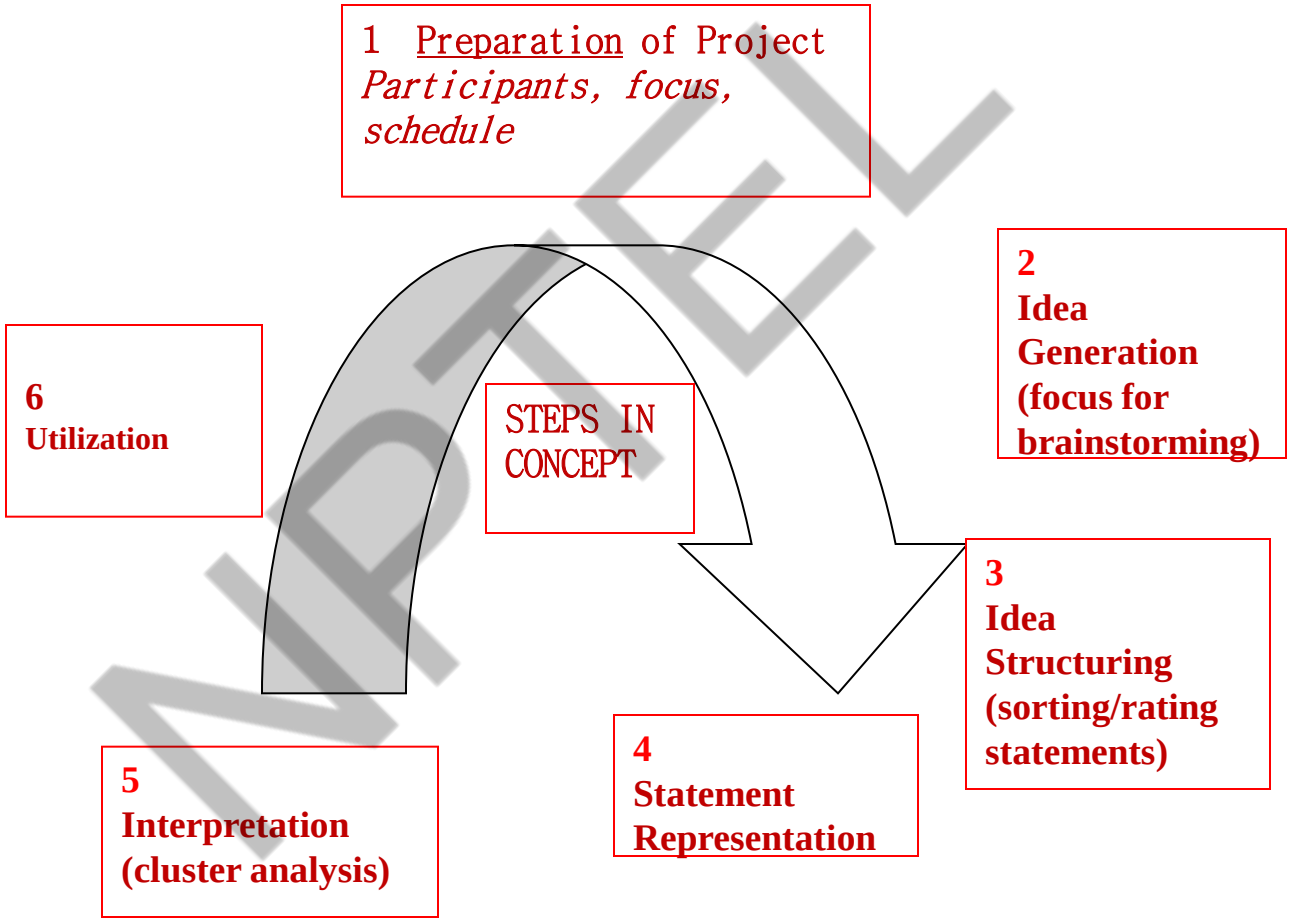
# Figure: Conceptual Map

Example-




Source: Awad, E.M & Ghaziri , H (2007). Knowledge Management

# Figure: Steps in Concept Mapping

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# Blackboarding

- A global memory structure  database or repository- 3 factors- *knowledge source (expert), blackboard and control mechanism*
- Assumes all participants are experts with unique experience
- Each expert has equal chance to contribute to the solution via the blackboard
- Process continues until the problem has been solved
- Diverse approaches to problem solving

# Blackboarding (cont'd)

- Participants share a common language for interaction
- Flexible representation of information
- Efficient storage and location of information
- Organized participation
- Iterative approach to problem solving