Module 4:
Knowledge Management

KBL Srivastava

Topics

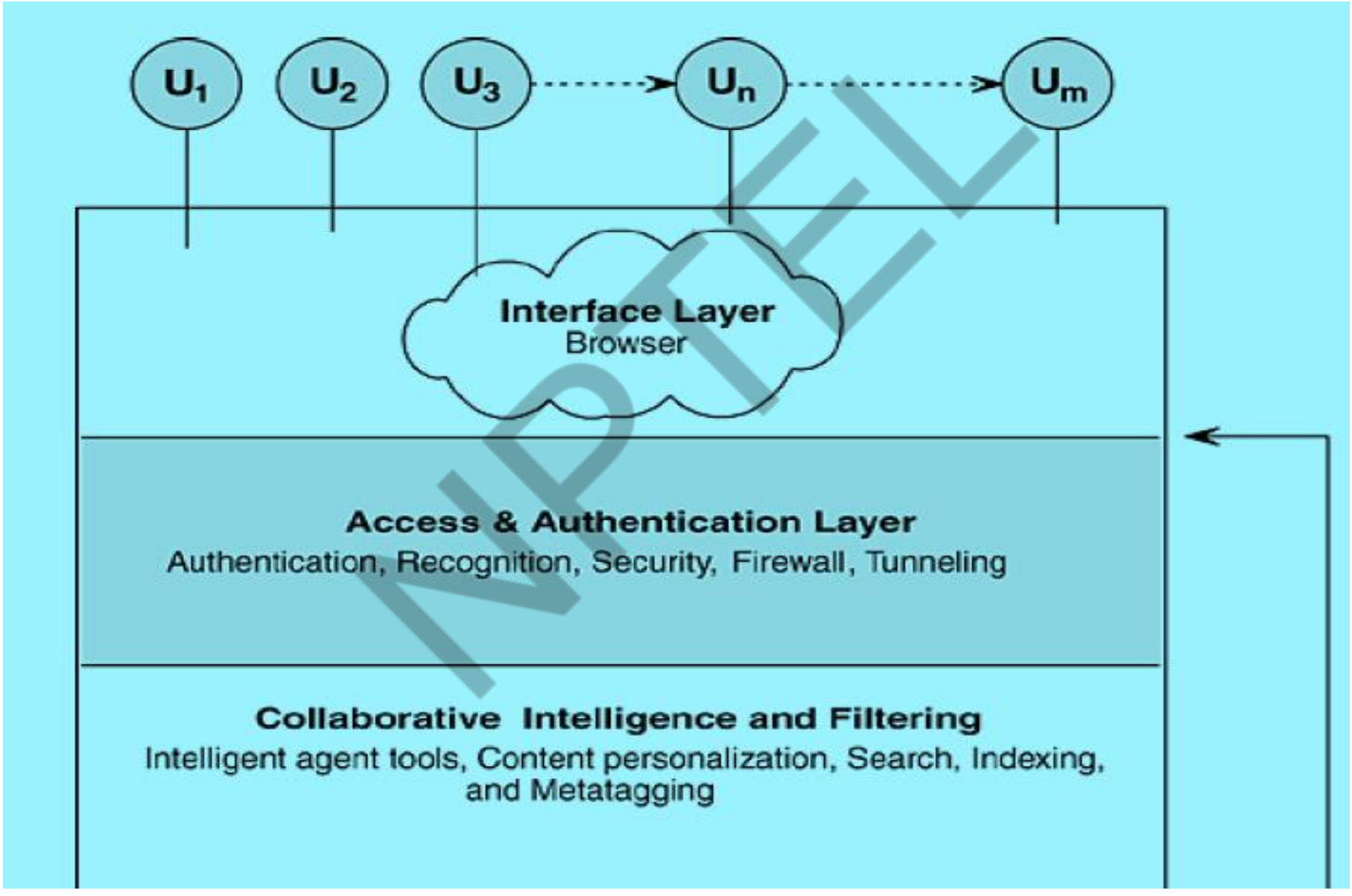
KM system : Analysis design, and development:

Knowledge infrastructure, Knowledge audit, and knowledge team

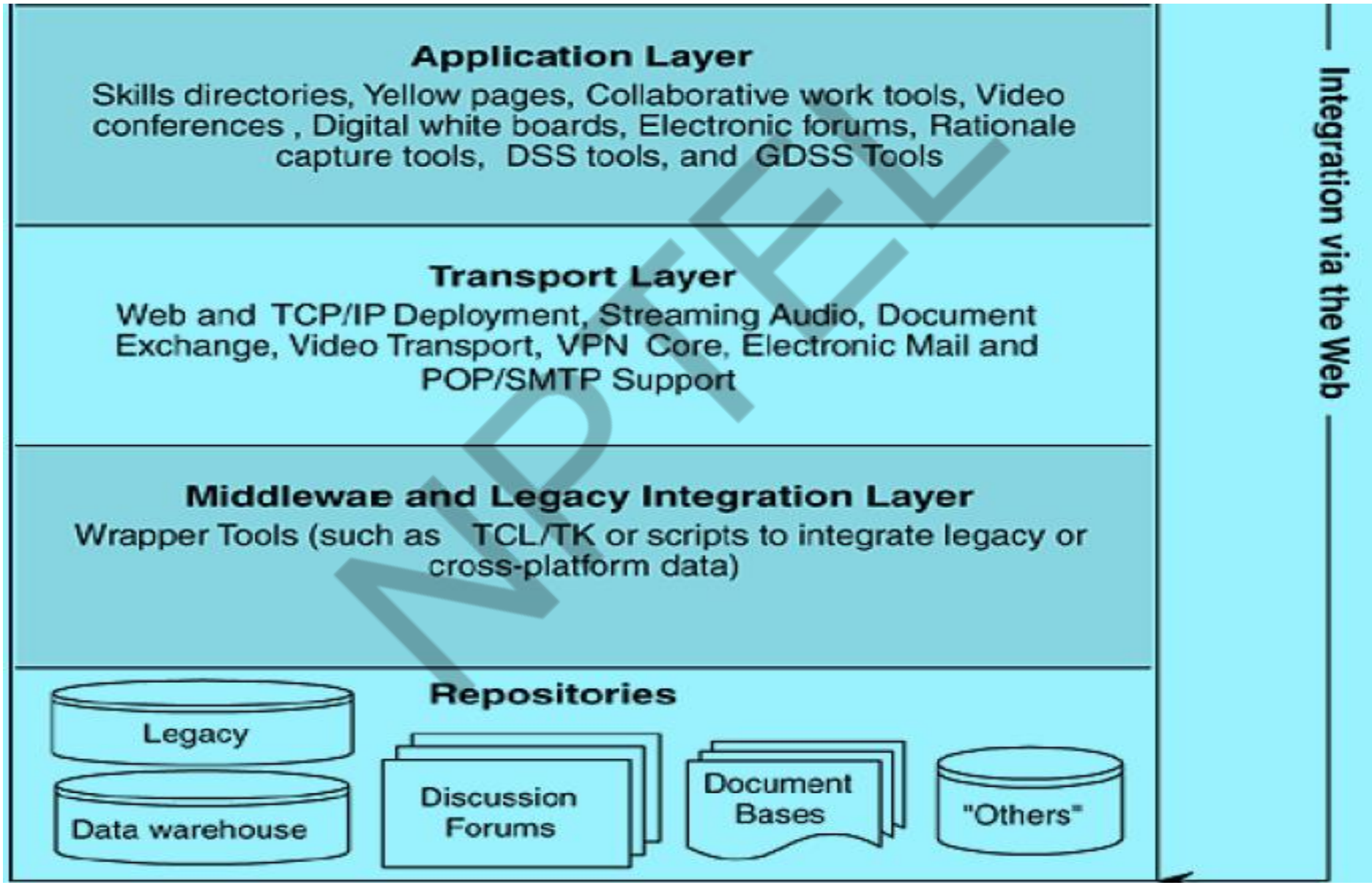
Knowledge Infrastructure

- Seven-layer knowledge management architecture and its underlying infrastructural elements.
- Examine the Technology that make up these layers and analyze various components that can be deployed to transform existing infrastructure into one that supports KM.

The seven layers of the knowledge management system architecture (Source: Tiwana, A.: Knowledge Management Toolkit, 2002)



The seven layers of the knowledge management system architecture (Continued)



KM processes and Technology enablers

- Select the technology components with the objectives clearly defined beforehand.
- A technology selection map to guide the technology selection process while keeping the actual need of the organization in focus.
- The focus of technology is to enhance two areas- Storage and retrieval and communication.
- Technology helps in capturing and distributing knowledge, and communication networks help in transfer and collaboration in KM system.

Knowledge process and technology enablers *(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)*

Knowledge Objective	Technology Enablers
Find knowledge	Knowledge-bases in consulting firms; search and retrieval tools that scan both formal and informal sources of knowledge; employee skills yellow pages.
Create new knowledge	Collaborative decision-making processes; DSS tools; rationale capture tools; Notes databases; decision repositories; externalization tools.
Package and assemble knowledge	Customized publishing tools; information refinery tools; push technology; customized discussion groups.
Apply knowledge	Search, retrieval, and storage tools to help organize and classify both formal and informal knowledge.
Reuse and revalidate knowledge	Customer support knowledge bases; consulting firm discussion databases; past project record databases and communities of practice.

Interface Layer

- The interface layer is the topmost layer in the KM system architecture.
- This is the only layer with which end users directly interact with the system.
- The effectiveness of this layer is a main determinant of the usability of a KM system.

Selection Criteria for the Collaborative Platform

1. **Efficient protocols: The network protocols used should not clog up bandwidth of the network and should allow secure and fast sharing of content across far-flung locations, including mobile clients and traveling machines.**
2. **Portable operation: Companies often have various platforms and operating system environments in use by different departments. The collaborative platform must be able to operate in portable manner across all these platform.**
3. **Consistent & easy-to-use client interfaces: Do not assume that the users are technology experts; many of them might come from nontechnical domains, departments, and backgrounds.**
4. **Scalability: As the number of users grows, the collaborative platform should be able to scale up without degradation in performance**
5. **Legacy integration: The collaborative platform must be able to integrate this data into the final interface.**
6. **Security: Security becomes an important aspect of design with enterprise being increasingly distributed**
7. **Flexibility and customizability: The choice of platform should allow for a reasonable degree of customization and flexibility- what the user can see and needs to see**

The Web or Lotus notes as platforms?

- It is easier for raw inputs such as spreadsheets, meeting notes, design documents, etc., to be converted into a storage-friendly format, but another problem arises
- **Companies need to standardize on specific platforms and operating systems in a perfect manner**.- Web based or Lotus notes for knowledge sharing

Comparison of Key Characteristics of Lotus Notes and the Web Protocol–based intranets as Primary Knowledge-Sharing Platforms

Characteristic	Notes	TCP/IP Intranets	Comments
Architecture	Proprietary	Open/evolving	The World Wide Web (www.w3.org) consortium is placing an increased focus on developing the Web as a powerful collaborative platform.
Security	High	Low by default	Can be enhanced with a variety of security tools.
Authentication	Strong	Stronger if used in a Windows 2000 type environment	Windows 2000 (the successor to Windows NT 4.0) provides strong authentication and security features for use in distributed environments such as those built around Web servers and wide-area networks.
Direct (initial) cost	Moderate to high	Close to none	The Internet is basically free. The only direct cost is that of a service provider, which most companies already have. You still do need someone to build the application, or you can buy it from someone.
Development cost	High	Low	You can use existing Web development skills within the company to build an intranet with a minimal number of inexpensive tools.
Technological maturity	High	Low	Web protocols are still evolving. However, most popular browsers support plug-ins to add newer capabilities to the client software.
Employee training cost	High	Low	Employees are often familiar with the Internet and the Web browser interface.
Initial investment	High	Low	Indicative only of the upfront costs.
Legacy integration	Low	High	*Wrappers* can be written to allow access to legacy data through a Web browser.
Cross-platform integration	Low	High	HTTP acts as the universal protocol that brings together content across all platforms that might be in use in your company.
Deployment time	Fast	Slower	While Notes deployment and customization is not always fast, it is usually faster than deploying an intranet with similar functionality.
Out-of-the-box solution	Yes	No/sometimes	Software vendors can customize generic intranets for quicker deployment.

(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Packaging of Knowledge

- Filtering, editing, searching and organizing pieces of knowledge, collectively called packaging, are essential though frequently overlooked components of successful KM.
- To capitalize on the wealth of intelligence available in an organization, knowledge must be packaged in such a way that it's insightful, relevant, and useful.
- To make content useful, package should include: Identification, Segmenting, Mass customization, Format, Tests

Issues of Knowledge Delivery

- Another issue is how much information should be delivered: all or in parts (selectively).
- One can also consider when to deliver knowledge: when needed (“just-in-time”) or when created or acquired (“just-in-case”).

Collaborative Intelligence and data warehouse

- It is important to understand the role of technology in the context of KM like which of these technologies fit with the KM system and how integrated will take place.
- A data warehouse is not very useful unless the data is organized in to meaningful information and applied whenever required.

Characteristics and Relative Fit of a Data Warehouse in the KM Infrastructure

Characteristic	Level	Downside
Response time	Low	Data might not be real time.
Scalability with growing needs	Medium	Depends on initial design optimization.
Flexibility of use	High	None.
Ease of use	High	Needs a good front end and interface for use.
Retrieval of data	Medium	The user needs to navigate through the interface and find the relevant data that helps make a decision.
Processing overhead	High	Not a relevant concern if the size is not too large. Parallel processing on x86 architecture and NT platforms makes it very viable. Cost might not be a major concern.
Accuracy	High	Depends on the quality* of data scrubbing. Accuracy is higher than the sources since "bad" data has been cleansed out.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Genetic Algorithm Tools

- In order to solve a problem or make a decision where standard rules of thumb fail to work or are impossible to use, one can try genetic-algorithm-based solutions, which is a good choice.
- GAs help a decision maker to state that I do not know how to build a good solution, but I will know it when I see it!"

The relative fit of GA-based tools in the KM technological framework

Characteristic	Downsides for Knowledge Management
Medium to high accuracy of solutions	Limited and relatively specialized applications.
High response speed/fast problem solving	May deteriorate as the problem increases in complexity.
Limited scalability	Computing resources often fall short of a complex GA-based solution. Some tools are available for Windows NT and Windows 2000 platforms and take advantage of the multi-processor capability that NT brings to the low-cost, high-performance x86 microprocessor family.
High levels of embeddability	Tools based on genetic algorithms tend to be highly dependent on software and the nature of the problem. While this specialization probably improves the performance of the tool, it also severely constrains its usability in other problem domains.
Development speed of typical solutions based on genetic algorithms is fairly high*	Solutions tend to be fairly specialized and have a narrow application domain
Low to medium ease of use	A majority of popular commercial tools available are for non-Windows platforms that are typically not used in most business environments.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Neural Networks

- A neural network is a networked computing architecture in which a number of processors are interconnected like the neurons in a human brain that can learn through trial and error.
- A neural network can identify patterns within such data without the need for a specialist or expert.
- Although theories on which neural networks are built might suggest that such nets can deal with “dirty” data, reality is quite different.

Key Characteristics of Neural Networks and Their Fit in the KM System Architecture

Characteristic	Downsides for KM Applications
High accuracy	Requires thorough training and preprocessing of data. Accuracy degrades as size and complexity increase beyond a certain level (depending on the type of problem being solved).
High response speed	Degrades as the net becomes increasingly complex.
High tolerance for "bad" data and noise contained within the input data	Requires preprocessing of data for the network to comprehend it. This requirement alone takes up a majority of the time spent building a neural network.
Mediocre flexibility	The neural network needs to be retrained with relevant data if it is to be used for a new application.
Low processing resource requirement	Requirements for processing power are lower than for most other types of data-based decision support systems. Commonplace desktop computing resources often suffice. These resources need to be boosted if larger amounts of data are fed or if the network size is scaled up.
Limited scalability	Data is needed; complexity of the problem might constrict scalability.
Limited need for domain experts or recorded expertise	Relevant data is needed. It also needs to be preprocessed.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Expert Reasoning & Rule-Based Systems

- Rule-based systems are diametric opposites of generic algorithm systems
  - In generic algorithm, you can specify universal conditions under which solutions are considered good, but you cannot apply expert knowledge on how to solve the problem.
  - In rule-based systems, you can bring in expert knowledge, but you cannot specify any universal conditions that denote a good solution.

Rule-Based Systems and Their Relative Fit in the KM Infrastructure

Characteristic	Downsides of Using in a KM System
High dependence on domain experts and specialists	Extensive inputs from domain specialists are needed. Very often, expert knowledge is explicated only to a limited extent, since much of it is tacit. First cuts on elicitation of this knowledge range from poor to acceptable and rarely ever rise to the level of perfection.
Higher speed of development	Rule-based systems can be developed at a fast pace only if knowledge can be elicited from experts in a thorough manner. This often takes up the largest chunk of development time.
Low levels of scalability	As problems being addressed become complex or evolve over time, rule bases need to be refined. If rules change over time, experts often need to be brought in again to revalidate the rules in use.
Slow response speeds	If the datasets grow large, rules grow more intermingled and complicated. This can often pose a serious challenge to the computing power in use. As problems get complicated, a multitude of rules need to be matched, which again degrades the response speed.
Low to medium flexibility	While small bases are quite flexible, as the problem becomes more complicated or involves new variables, the inflexibility of the system becomes an apparent disadvantage.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Granularity in Knowledge Objects

- Because a KM system is intended as a mechanism for securing corporate knowledge, it needs to be populated with knowledge objects.
- A key failure point in the design of a KM system is not deciding on the right level of detail at the start.

Granularity in Knowledge Objects

Levels of Increasing Granularity in a KM System Represent the Depth of Detail that a KM System Deals With

Knowledge Object	Example of Such an Object in a Clinical (Diagnostic) Knowledge Management System
Knowledge domain	Internal medicine.
Knowledge region	Neurology.
Knowledge section	Brain diseases; tumors.
Knowledge segment	Diagnosis of brain tumors and cancerous growth.
Knowledge element	General diagnostic strategies.
Knowledge fragment	If the symptom reported by the patient is continual headaches, then consider the possibility of a brain tumor.
Knowledge atom	Excessive and continual headaches is a symptom.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Granularity in Knowledge Objects

- Too high a level of granularity will result in the loss of knowledge richness and context; too low a level will cause unnecessary drain on network, storage, and human resources, raise the cost, and reduce the value of the object.
- The key lies in selecting the right level of molecularity of knowledge that will be stored in your KM system: the level that strikes an optimum balance between the two opposite extremes of too much details and too little detail, both of which can render knowledge only marginally useful.

Example of Customer support and Knowledge levels

Knowledge Object	Example of Such an Object in a Business Knowledge Management System
Knowledge domain	Customer support for home computers.
Knowledge region	Hardware.
Knowledge section	Memory diagnostics.
Knowledge segment	Diagnosis of memory-related problems using general diagnostic strategies.
Knowledge element	Memory diagnostic strategies based on symptoms; collect all symptoms and eliminate all possibilities until the only one left is a memory failure/hardware fault.
Knowledge fragment	If the symptom reported by the customer is system lockups and continual beeping, consider the possibility of a memory problem.
Knowledge atom	Frequent lockups; blue-screen-related beeping; failure to boot up are all symptoms.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Infrastructural Elements for Searching, Indexing, & Retrieval

- Indexing and retrieval capability of a KM system determine the ease with which a user can find relevant knowledge on the system.
- Four types of navigation strategies can be deployed in varying combinations:
  - Meta searching
  - Hierarchical searching
  - Attribute searching
  - Content searching

Meta searching and Hierarchical Searching

- The main purpose of a meta search function is to minimize the time spent in locating a general category for a piece of potential knowledge within a repository.
- A hierarchical search strategy organizes knowledge items in a fixed hierarchy.
- The user can follow or traverse links within such a structure to efficiently locate the right knowledge element in a timely manner.
- This method is therefore apt for use in intranets, since they support hyperlinking by defualt.

Attribute Searching

- Searching by attributes use a value input by the user.
- The attribute value is matched against closely related values attached to the documents and pointers such as skills databases.
- Those that closely match are returned as the final search results.
- The limits of Attribute Searching
  - Excessive query matches
  - Breadth tradeoffs
  - Failure to understand meanings of words and exact context of use

Content Searching

- Content searching is the least efficient of the search strategies discussed here.
- The user enters an arbitrary search term, keyword, or text string. All items that match are returned with a relevance score.
- Score assignment is based on the frequency of matches within each knowledge element such as a document or Website.

Strategies-

- To enable effective searching, use all or several of these search and retrieval strategies in parallel.
- Using a single search technique can pose sever limitations on the quality of the search

Tagging Knowledge Elements with Attributes

- Because searching works primarily on the basis of textual string matching, it is important that content – both formal and informal – be tagged with a proper set of attributes.
- A company must define its own set of attributes to tag knowledge content with.

Tagging attribute for knowledge elements in a KM system

Attribute Type	Tagging Attribute
A	Activities
D	Domain
F	Form
T	Type
P	Products and services
I	Time
L	Location

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Activities Attribute

- The activities attribute refers to the organizational activities to which the given knowledge element is related.
- The value of this attribute must be defined up front, and individual values need not be mutually exclusive.
- Therefore, your company must have an explicit model of the activities and processes that are carried on during the course of “running the business.”

Domain Attribute

- The domain attribute tags the knowledge item to its subject matter.
- This attribute is the primary attribute that drives the meta search process.
- Principles of KE cannot be applied here because those are more concerned with modeling knowledge at the level of concepts and relations, which is too micro for our purpose here.

Type attribute

- The type attribute is more relevant to formalized knowledge that is captured in electronic or textual form such as a document or a report.

  - *Procedure*
  - *Guideline*
  - *Protocol*
  - *Manual*
  - *Reference*
  - *Time line*
  - *Worst practice report*
  - *Best practice report*
  - *Note*
  - *Memo*
  - *Failure report*
  - *Success report*
  - *Press release/report*
  - *Competitive intelligence report*

Products & Services Attribute

- The product and service attribute specifies the product or service to which the knowledge element relates.
- The list should be kept specific and should not overlap.
  - Strategic consulting
  - Implementation consulting
  - E-commerce consulting

Time Attribute

- The time attribute is useful for time-stamping events and knowledge elements.
- Consequently, creation or use of an explicated knowledge object must be specified.
- Not all knowledge objects can be assigned a value for this attribute, so assign a value to this attribute where possible.

Location Attribute

- Use the location attribute to specify the location of pointers that track people within and outside the company.
- Not all knowledge elements will have a value assign to this attribute, but it can be used to narrow search by location.
- Make sure that the attribute usage and its values are actually significantly relevant.

Differences between a KM system and a data warehouse

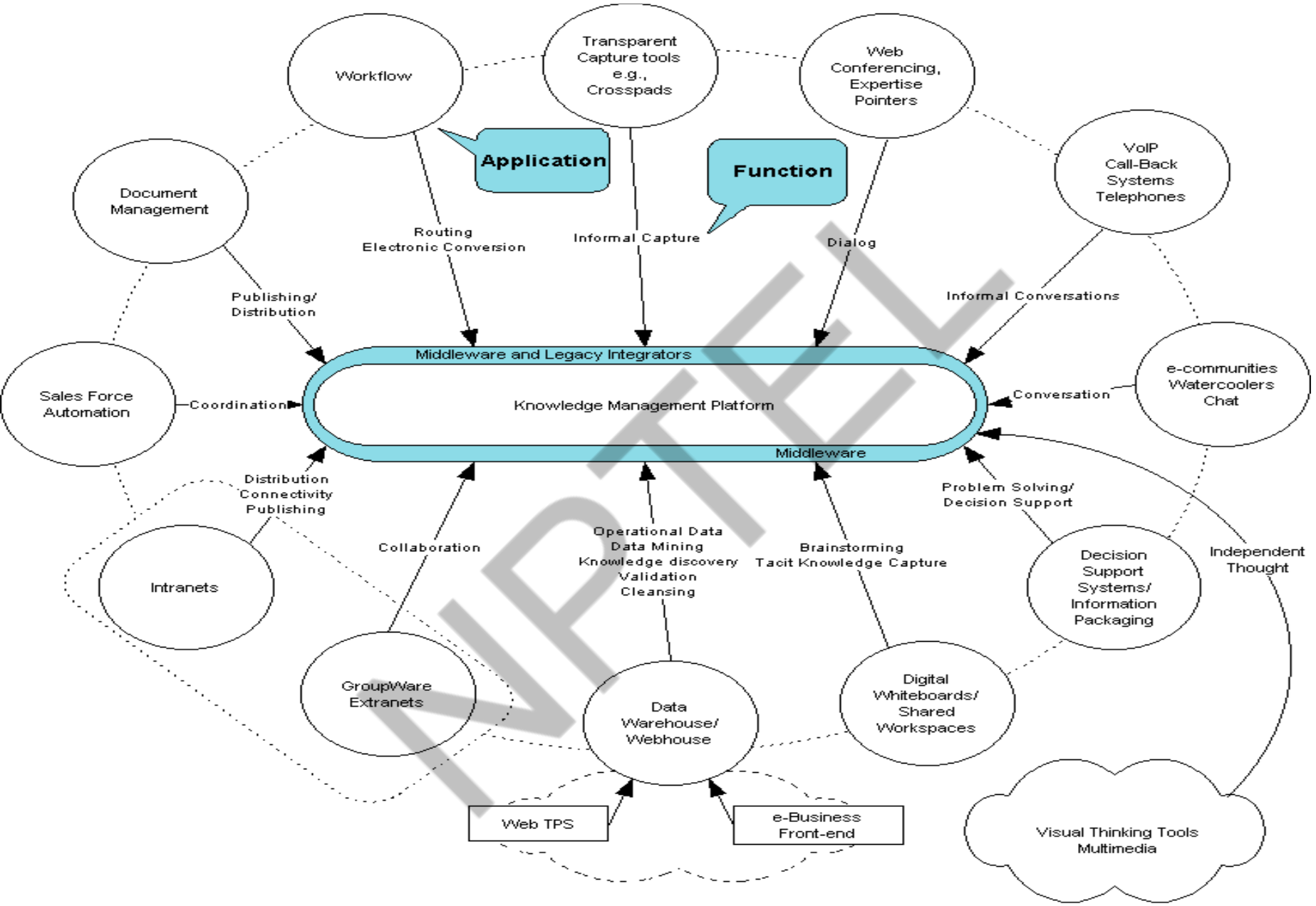
- Types of information managed
  - A data warehouse focuses more on highly structured content, whereas a KM system needs to support both informal and formal content and everything in between.
  - A data warehouse can be a part of a KM system, only as a source of structured data that is input to the complex collaborative filtering mechanisms of the KM system
- Context
  - A data warehouse is arguably a resource of unquestionable value when you need mine factual data.
  - When such data is mined and interpreted, it provides value.
  - But the need for interpretation is a fuzzy idea; data warehouses, by themselves, are devoid of context.
- Size
  - Since a data warehouse primarily focus on clean, structured, and organized data, the size of a data warehouse is always large.
  - A KM system might have storage system sizes ranging from very small to extremely large.

Differences between a KM system and a data warehouse

- Content focus
  - The content focus of a KM system is on highly filtered information and on knowledge, whereas that of a data warehouse is on scrubbed, raw, clean, and organized data
- Performance
  - Because of the complex nature of retrieval and classification requests that a KM system must be able to handle, performance requirements and computing power needed for a KM system are much higher than those of a data warehouse
- Networks
  - A data warehouse does not need to be on a live network to function properly; however, this live network is imperative for a KM system that is trying to draw from resources available throughout the entire enterprise and beyond it – from the Internet and collaborative, extended enterprise.

The application layer

- Tools that enable integration of information across tacit (such as people) and explicit (such as databases, transaction-processing repositories, and data warehouse) sources help create and share context (the process itself is called contextualization), and facilitate sense making.



Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Intranets and Extranets

- One of the most important aspects of information access is that of being able to view content of documents regardless of file formats, operating system, or communications protocol.
- Intranets, owing to their consistent, platform-independent access formats, such as rich HTML, and a common, consistent protocol (HTTP), make this possible.

Pointers to expertise

- Electronic yellow pages
- When a key resource person is needed or when a person with specific skill sets or expertise is required, keyword and attribute tag searching can pull up pointers with contact information about persons who qualify, both inside and outside the organization.

Document management

- A lot of crucial information often exists primarily on paper. Companies try to convert this information into a more easily transferable and searchable electronic format by scanning these documents.
- Document management fosters the ability to develop a database of documents and classify them automatically.

Project management tools

- Although the role of PM tools in the actual creation of knowledge is limited, these tools can provide a good basis for organizing and storing documents, records, notes, etc., coming out of a single project engagement.
- Many companies populate these tools in a post project phase, leaving the accuracy of project history traceability open to questions.

Video Conferencing and Multimedia

- Video conferencing enables people to exchange both full-motion video and audio across a distributed network.
- In a KM system, multimedia allows the system to capture information content that would otherwise be lost forever.
- Multimedia, especially video content, bypass limitations of languages – an occasional barrier to knowledge sharing when you are working in transational project.

Transparent capture enablers

- Digital whiteboards
- Tools such as this are indispensable in moving a company from a structured, information-based focus to a formal and informal, knowledge-centric focus.

Virtual share spaces

- There must be a way to encourage and enable informal chat and conversations (even office gossip) that are a part of work life in most office settings.
- Virtual meetings
- Document collaboration
- Informal communication

Mind mapping

- Mind maps, very similar to concept maps, can be used to organize individual or collective thought and represent it visually.
- Mind mapping can be an excellent knowledge creation and organization tool, especially with the advent of excellent software supporting it.

Intelligent decision support systems

- Decision support systems, case-based reasoning system, and contextual information retrieval systems provide the needed historical base from past experience that help make both minor and major decisions fast and accurately.
- Data mining tools help extract trends and patterns from transactional repositories, such as data warehouses.

The promise of peer-to-peer knowledge networks

- Peer-to-peer networking naturally extends to support KM because it closely mirrors face-to-face human communication.
- Peer-to-peer networking is defined as sharing of resources by direct exchange between individual systems in a digital network.

Affinity to infinity

- Individuals initially begin to share information, expertise, best practices, and content in peer networks because of the affinity that networks create.
- Each additional member increase the potential value of the network manifold or, in economic term, create increasing value.
- Intricate webs of affiliations open multitudinous possibilities for collaborative knowledge integration in autonomous groups that can be spontaneously assembled and disassembled.

Other benefits of Peer-to-Peer knowledge platforms

- First, decentralization eliminates the overhead of maintaining resource and expertise profiles for individuals in corporate yellow pages.
- Second, knowledge sharing relies heavily on rich media, such as voice, video, and multimedia, to overcome the limitations of text to share tacit knowledge.
- Third, their explicit knowledge and profiles of mobile users can be redundantly replicated across nodes to ensure ubiquitous availability.

Technological solutions for motivational issues

- Understanding what motivates people to apply their expertise is key to avoiding the trap of building technology marvels that no one uses.
  - First, users will contribute and share their insight only when they value their digital community.
  - Second, shred contest is essential to contribute meaningful to collective task.
  - Third, peer-to-peer environments must emphasize knowledge integration over acquisition or learning.
  - Finally, such environments must provide reputation-building mechanisms to foster a pervasive thread of trust on which any community stands.

2. Knowledge audit

Why Audit Knowledge?

- Devising a knowledge-based strategy
- Architecting a KM blueprint
- Seeking to leverage its "people assets"
- Trying to figure a way out of corporate ebbing
- Striving to strengthen its own competitive weaknesses
- Facing competition from knowledge-intensive competitors that are far ahead on the learning curve

Measuring knowledge growth

- Very often, companies do not know where they stand in terms of the knowledge that they possess.
- Bohn's framework provides an excellent starting point for figuring out where you stand, relatively, in terms of your firm's knowledge.

Measuring Knowledge Growth (Bohn Stages)

Stage	Name	Comment	Typical Form of Knowledge
1	Complete ignorance	Nothing known.	Does not exist anywhere.
2	Awareness	Resembles pure art.	Knowledge is primarily tacit.
3	Measure	It's pretechnological.	Knowledge is primarily written.
4	Control of the mean	A scientific method is feasible.	Written and embodied in hardware.
5	Process capability	A local recipe exists	Hardware and operating manuals.
6	Process characterization	Tradeoffs to reduce costs are known.	Empirical equations (quantitative).
7	Know why	Takes on the form of science.	Procedures, methodologies, scientific formulas, and algorithms.
8	Complete knowledge	Nirvana.	Never happens; but you can always hope for it!

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Ranking Characteristics of Knowledge Work and Processes Along Each Stage and the Effects of Each Stage on Them

Stage of Knowledge	1	2	3	4	5	6	7	8
Nature of production	Expertise based				Procedure based			
Role of workers	Everything			Problem solving			Learning and improving	
Location of knowledge	Tacit			Written and oral			In databases or software	
Nature of problem solving	Trial and error			Scientific method			Table lookup	
Natural organization type	Organic			Mechanistic			Learning	
Suitability for automation	None						High	
Ease of transfer	Low						High	
Feasible product variety	High			Low			High	
Quality control	Sorting			Statistical process control			Feed forward	

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Measuring knowledge growth

- You can measure the intellectual dimensions of the following:
  - Your company's initial standing
  - Your competitor's standing
  - Your company's progress along this scale
  - Steps and directions to move your company up on this scale

Stages of Knowledge growth: Status of the organization

Stage	Knowledge Stage	Knowledge Characteristic	Location of Knowledge	Work Processes	Learning Method
0	Total Ignorance	Cannot tell the good state from the bad	Undefined.	Undefined.	Undefined.
1	Pure Art	Pure art	In the expert's head; so tacit that it cannot even be articulated.	Rely on trial and error.	Keep repeating processes. Hope for some pattern(s) to emerge.
2	Awareness	List of possibly relevant variables exists	In the expert's head (tacit); however, the expert can express it in words, diagrams, etc., although in a very limited way.	Experts can dictate conditions for processes to work well. Some degree of randomness still exists; start with methods that might have worked in earlier problems.	Experts, instead of all other people, keep repeating processes. Hope for some pattern(s) to emerge.
3	Measure	Pretechnological	You are able to decide which variables are more important by noting their correlation with desirable outputs.	Patterns begin to emerge; experts will, however, differ in their opinions on why successful processes were successful.	Same as above. You can be more creative and tweak processes to see changes.
4	Control of the mean	Scientific method feasible	Written and embodied in hardware/software to some extent.	Some parts of the knowledge underlying the process can be explicated, codified, and written down. However, a "recipe" is yet to emerge.	Keep good records of what was done, what happened, and the final outcomes.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Stages of Knowledge growth: Status of the organization

Stage	Knowledge Stage	Knowledge Characteristic	Location of Knowledge	Work Processes	Learning Method
5	Process capability	Local repeatable recipe	A local recipe based on experience is developed; it often works, but not always; the notion of following a procedure to obtain desirable results begins to emerge. The recipe might or might not be formally written down in its entirety.	A semi-reliable recipe emerges. Some steps in the recipe might still be random or inconsistent. Work processes are tackled using this somewhat repeatable (partially explicated recipe).	Use the records kept in the preceding stages and determine statistic patterns that work.
6	Process characterization	Tradeoffs to reduce costs; a well-developed recipe along with a limited knowledge of how contingencies are to be handled now exists.	Knowledge is well documented in the recipe; a methodology is developed; it almost always works; applying the process is almost a mechanical task of applying the recipe.	Very mechanized; highly automated; uses a time-proven methodology.	Use the proven methodology; continuous application of the methodology (recipe) will allow weaknesses and problems in the recipe to emerge.
7	Know why	Science; automation is possible; a formal or informal quantitative model is developed.	Most of the relevant knowledge is documented; most of tacit knowledge is converted to explicit; almost all knowledge can be codified and built into computer software; strong knowledge of how contingencies can be dealt with now exists.	Codifed in computer software and process manuals.	More of the above; this is as good as it gets!

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Stages of Knowledge growth: Status of the organization

Stage	Knowledge Stage	Knowledge Characteristic	Location of Knowledge	Work Processes	Learning Method
8	Complete knowledge	Nirvana	Rarely possible.	No need for knowledge management or knowledge managers. Knowledge management becomes a natural part of the firm or group; it is done perfectly; unlikely to ever be achieved.	This stage might never be reached; you will never know when you are here; occasional variations resulting in the inability to apply processes from the preceding stage push it back to stage 7.

Bohn, Roger. E. Measuring and Managing Technological Knowledge, *Sloan Management Review*, vol 36, Fall (1994), 61–73.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

From Art to Science

- Progression of a company **from** one that is highly dependent on the tacit knowledge of a few individuals **to** one in which both explicit and tacit knowledge are shared and easily accessible can be best described as a progression from **art** highly subjective and dependent on the doer's tacit knowledge) to **science** (repeatable and robust methodology capable of handling variations).

The Knowledge Audit Team

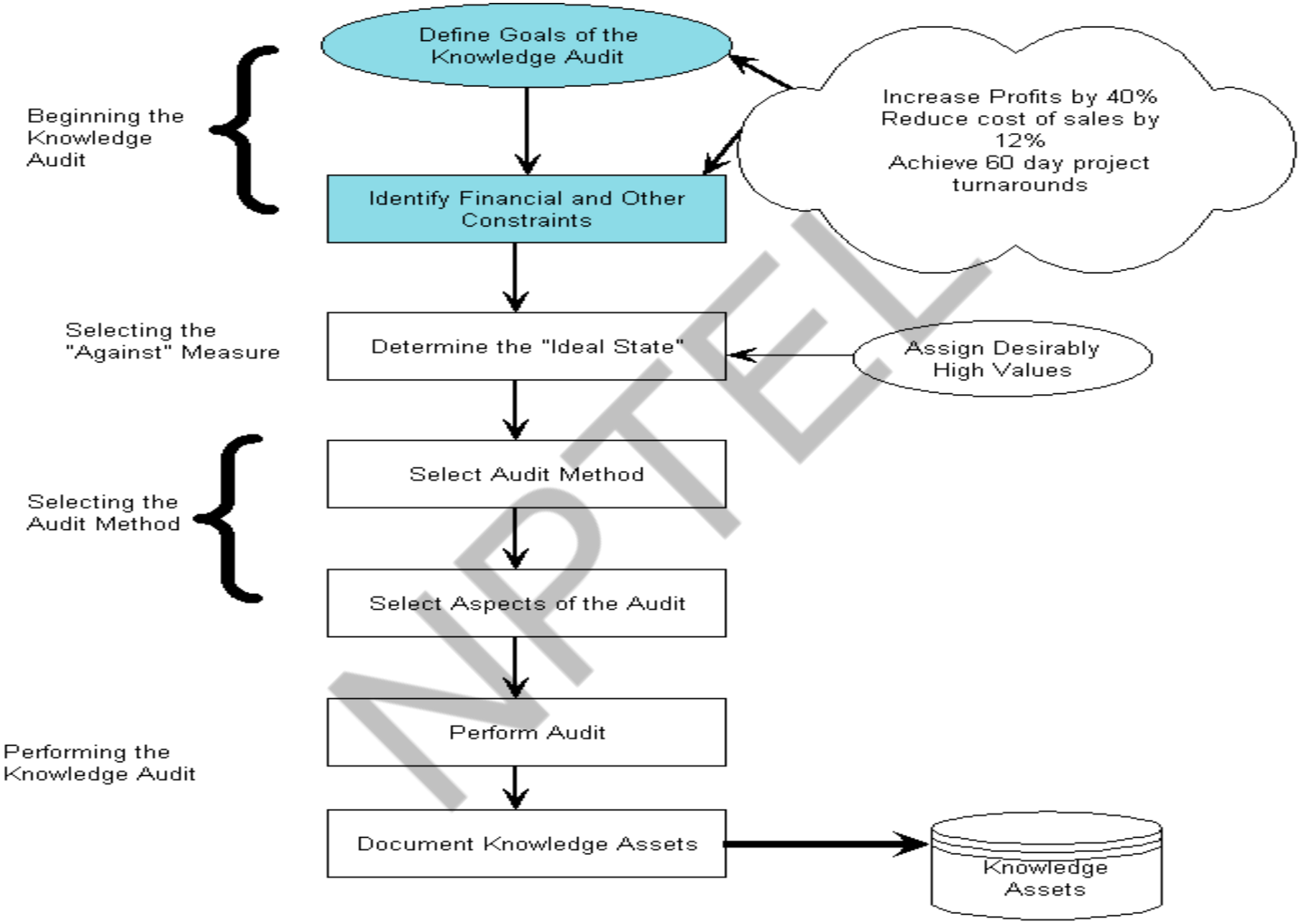
- The audit team needs representatives from *at least* the following areas.
  - Corporate strategist
  - Senior management, visionary, or evangelist.
  - Human resource manager
  - Marketer
  - Information technologist
  - Knowledge analyst
- Planning a knowledge audit
  - Once the rationale is explicitly written down, the team must identify the optimum level of performance and the highest, reasonably achievable levels of performance at which each component of the knowledge assets should operate.

Conducting the knowledge audit

- The knowledge audit consists of a sequence of six steps:
  - Define the goals
  - Determine the ideal state
  - Select the audit method
  - Document existing knowledge assets
  - Track knowledge growth over time
  - Analyzing the populated capability quadrants

Defining the goals

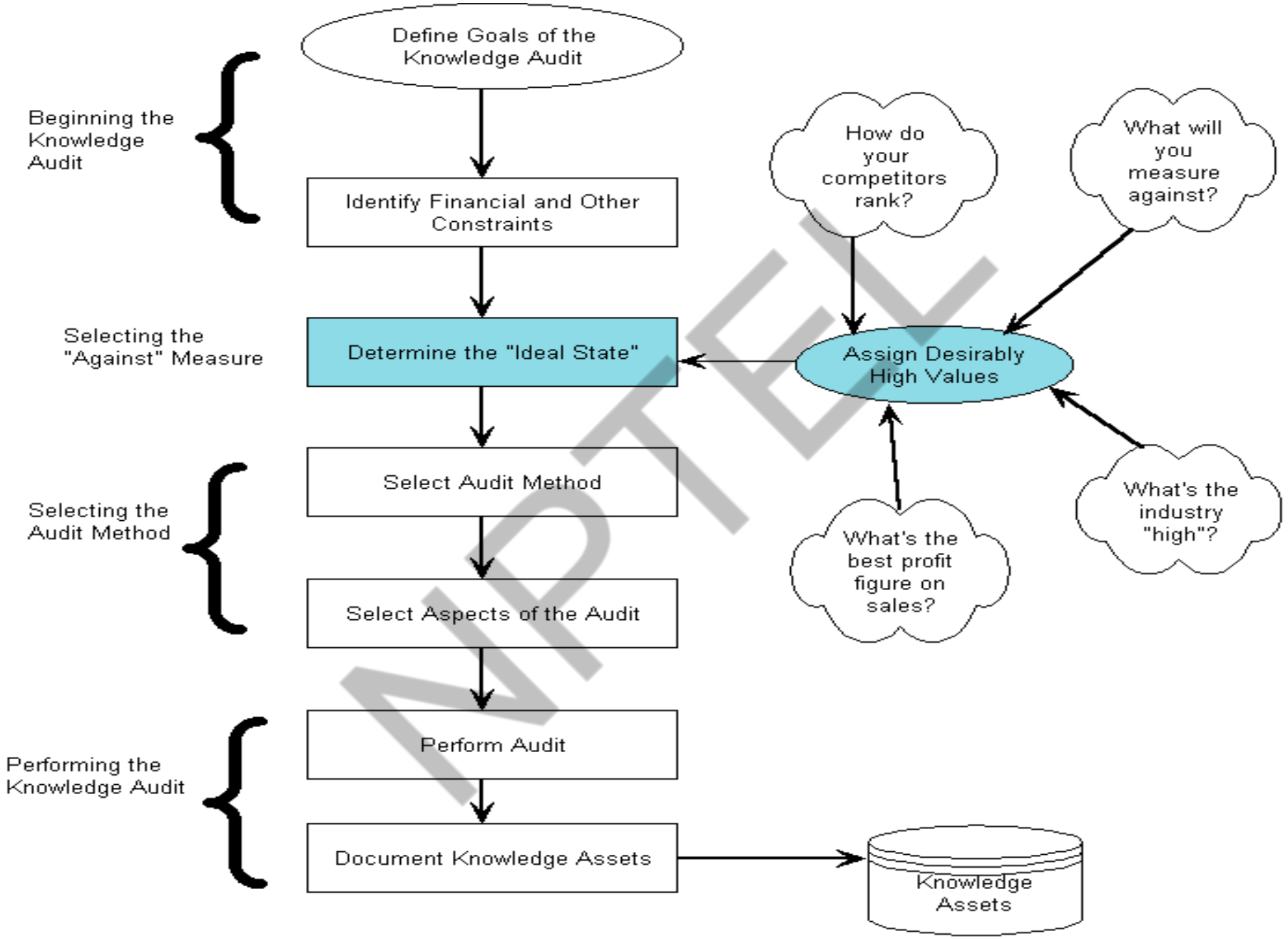
- When you think about goals, thinks of specific ones, such as:
  - We need to increase profits by 40 percent by next year.
  - We need to reduce cost of sales by 12 percent before the end of the fiscal year.
  - We want to improve customer retention by 4 percent within 18 months.
  - We want to increase project turnaround speed by 14 days on the average over the next 3 years.



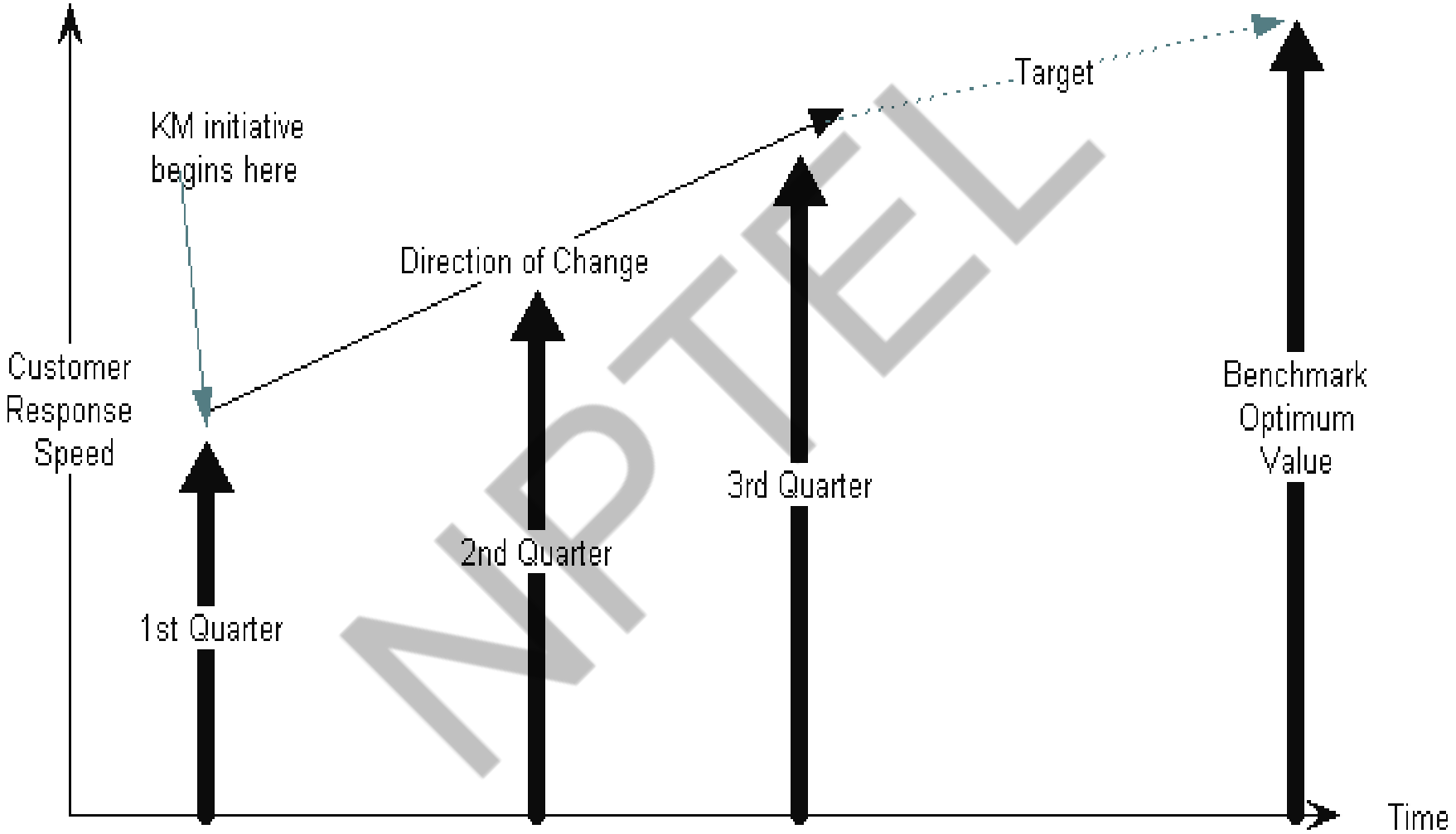
Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Determining the ideal state

- In this stage, you and your knowledge audit team must reach a consensus on what you consider the beat state that you could wish for and more reasonably reach, albeit with great difficulty.
  - This is the best case scenario against which you will judge your entire knowledge management initiative later on.
- Knowledge of what the best value of your knowledge assets should be, is essential to allow you to measure the results of your KM efforts against a relevant and stationary benchmark.



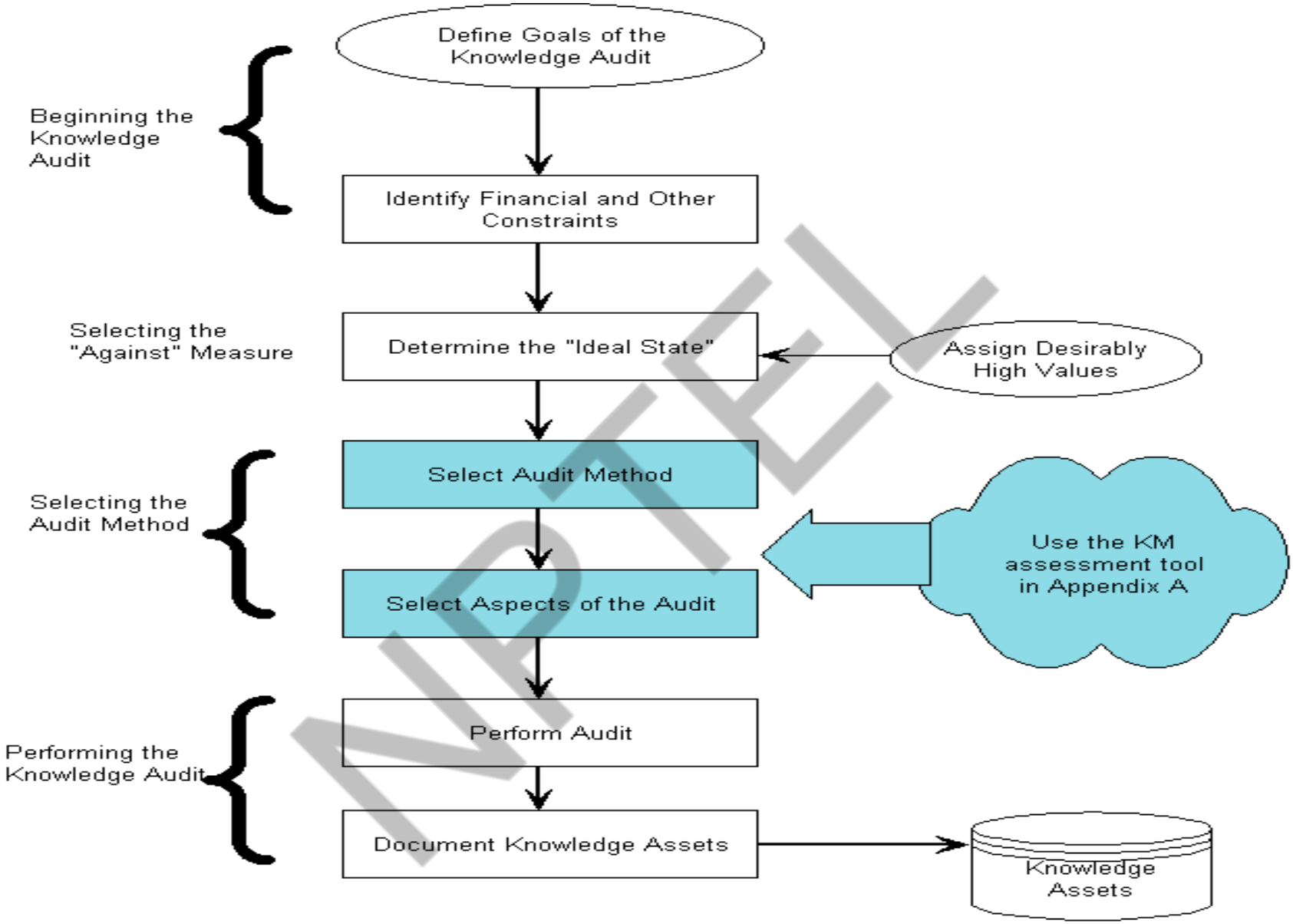
Source: Tiwana, A.: Knowledge Management Toolkit, 2002)



Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Selecting the audit method

- The method you use for auditing your company's or group's knowledge determines the degree to which you will accurately gauge the current (pre-KM) state of that aspect or knowledge dimension.
- The audit method that your decide to use must account for at least the following three critical intangible assets:
  - Employee know-how
  - Reputation
  - Organizational culture



Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Documenting knowledge assets

- It is essential to document the knowledge-based assets that your company has in a consistent framework.
- The framework makes it easier to compare with previously measured values and with corresponding values for your competitors.

Capability framework for positioning knowledge related assets

Regulatory Capability	Positional Capability
• Patents	• Path-dependent capabilities
• Trademarks	• Reputation
• Registered designs	• Value chain configuration
• Trade secrets	• Distribution networks
• Licenses	• Installed base
• Proprietary technology	• Customer base
• Methodologies	• Market share
• Databases	• Liquidity
	• Product reputation
	• Service reputation
	• Service product (such as consulting outcomes) reputation

Functional Capability	Cultural Capability
• Lead times	• Tradition or corporate culture of being the best (Apple?)
• Accessibility of past knowledge	• Tradition of sharing
• Innovative capabilities	• The tradition of co-opetition
• Individual and team skills	• The tradition of co-operation
• Distributor know-how	• Perception of quality standards
• Employee skills	• Ability of employees to work in teams
	• Capability to respond to market challenges
	• Innovation
	• Entrepreneurial and intrapreneurial drive in employees
	• Employee initiative and motivation

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Capability framework for positioning knowledge related assets

Diagnostic Questions to Evaluate Each Unit of Knowledge Analysis on Bohn's Scale

Stage	Description/Diagnostic
0	We don't even know the good from the bad in terms of outcomes! (You probably don't need this book then; nothing is going to help!)
1	We have no knowledge; each time we have to make a decision, it is by trial and error.
2	We have only tacit knowledge which is in the form of personal knowledge held by person _____ and _____.
3	We have tacit knowledge; we have converted it into heuristics and rules of thumb;* they often work.
4	Knowledge (some) exists in explicated form, but no one really uses it.
5	Knowledge exists in explicated form. We use it but need tacit knowledge possessed by person _____ to be able to apply it in some circumstances; but unless things are really different from normal, we can do without the tacit component. Whenever we use this explicit knowledge, we validate it or contribute back to it.
6	Knowledge exists in explicated form. We use it but need tacit knowledge possessed by person _____ to be able to apply it in some circumstances; but unless things are really different from normal, we can do without the tacit component. Whenever we use this explicit knowledge, we validate it or contribute back to it.
7	Tried and tested models now exist. We can simulate conditions; do what-if analysis in complex circumstances; modify behavior accordingly; it always works. Tacit content of the sum total of knowledge is very low. We validate existing knowledge whenever we use it. Our company has a strong "unlearning" capability. Our culture truly promotes knowledge sharing and synergy. We do not think that we have left any stone unturned in leveraging our company's knowledge. Employee walkouts do not hurt us in any significant way.
8	Difficult to characterize.

Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Tracking knowledge growth over time

1. How is the stock of this knowledge resource increasing?
2. Is it increasing? If so, how do we know that it is?
3. How can we ensure that the stock (or knowledge) continues to increase?
4. Are we making the best use of this knowledge resource?
5. Do all employees recognize the value of this resource?

Tracking knowledge growth over time

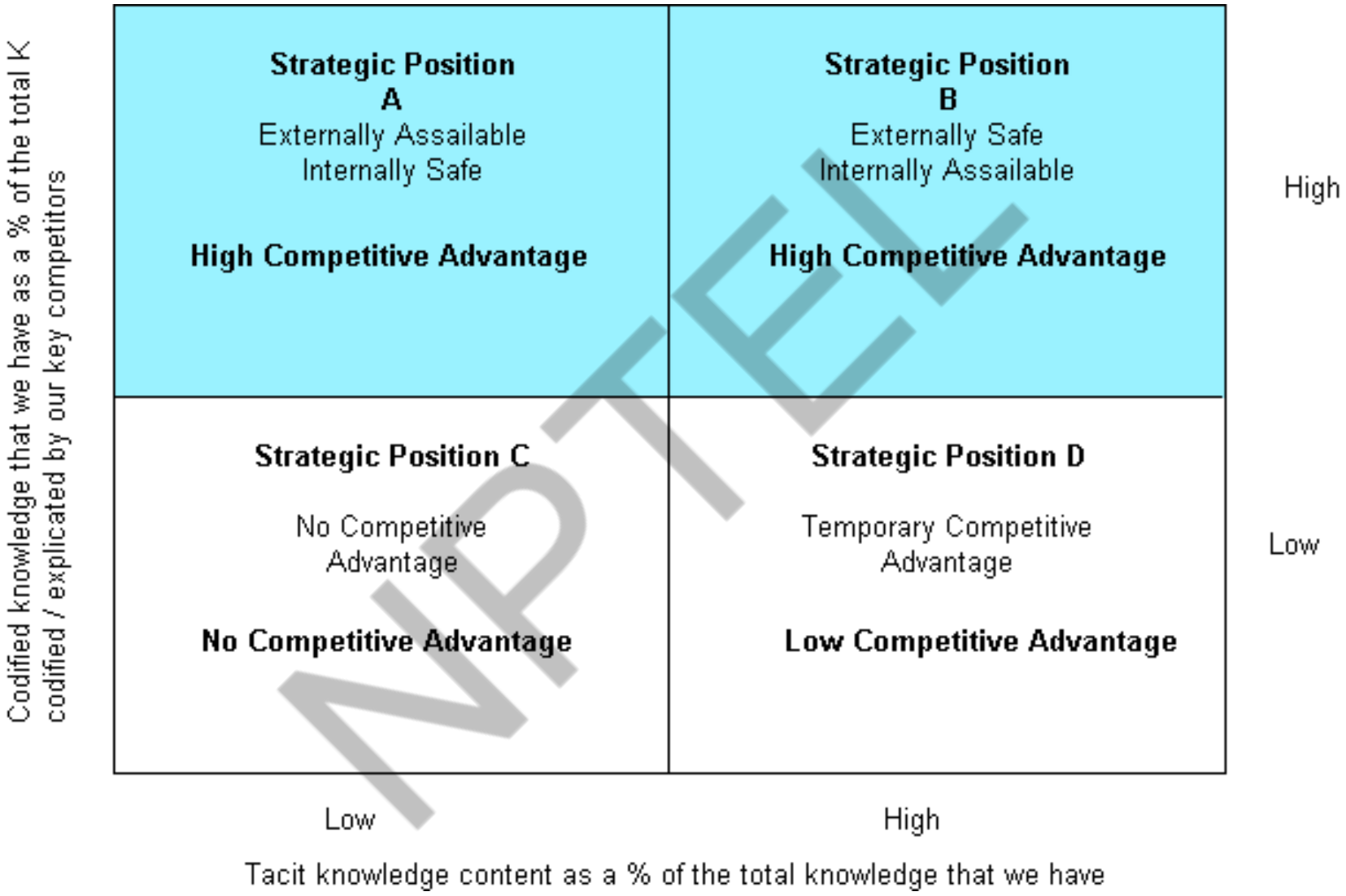
6. How durable is this knowledge asset? Will it decline over a period of time? How easily can others (competition) identify and copy this resource?
7. Can the competition easily nurture and grow this knowledge?
8. Is there any aspect that our competition has leveraged but we have not?
9. Can we imitate it? Need we?
10. Can this knowledge "walk out of the door"?
11. How is it changing over time?
12. Will our company need it after X (define X) years?

Strategic Positioning within the Technology Framework

- Mapping knowledge in each of the areas that you chose in the earlier stages of the knowledge audit, as describes in Figure above provides excellent insight into the way KM and business strategy can be kept in perfect synchronization.
- This insight can help in determining the strategic position and competitive advantage possessed by the firm in terms of the explicit and tacit knowledge contained within the firm – in people's head, databases, resident experience, electronic discussions, and KM systems.

The Four Positioning Choices

- The green shaded areas indicate a high competitive advantage – areas where your knowledge is already well managed but can possibly be improved.
- The right cells in the matrix represent the two quadrants where KM holds the most promise for producing groundbreaking results.
- Knowledge that falls outside these shaded areas represents those areas where the support of a KM system and an effective KM strategy is most needed.



Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Strategic Positions

- Strategic position A: indicates that your company is internally safe but externally vulnerable on this front.
- Strategic position B: indicates that your company has managed to explicate some portion of its knowledge; however, this is a relatively small percentage of what your competitors have managed to explicate.
- Strategic position C: A fundamentally weak position, where your company has to strategic advantage whatsoever.
- Strategic position D: Most desirable. Currently successful but need to manage knowledge in such a manner that their temporary advantage is converted into a longer term, sustainable competitive advantage.

3.Design The KM Team

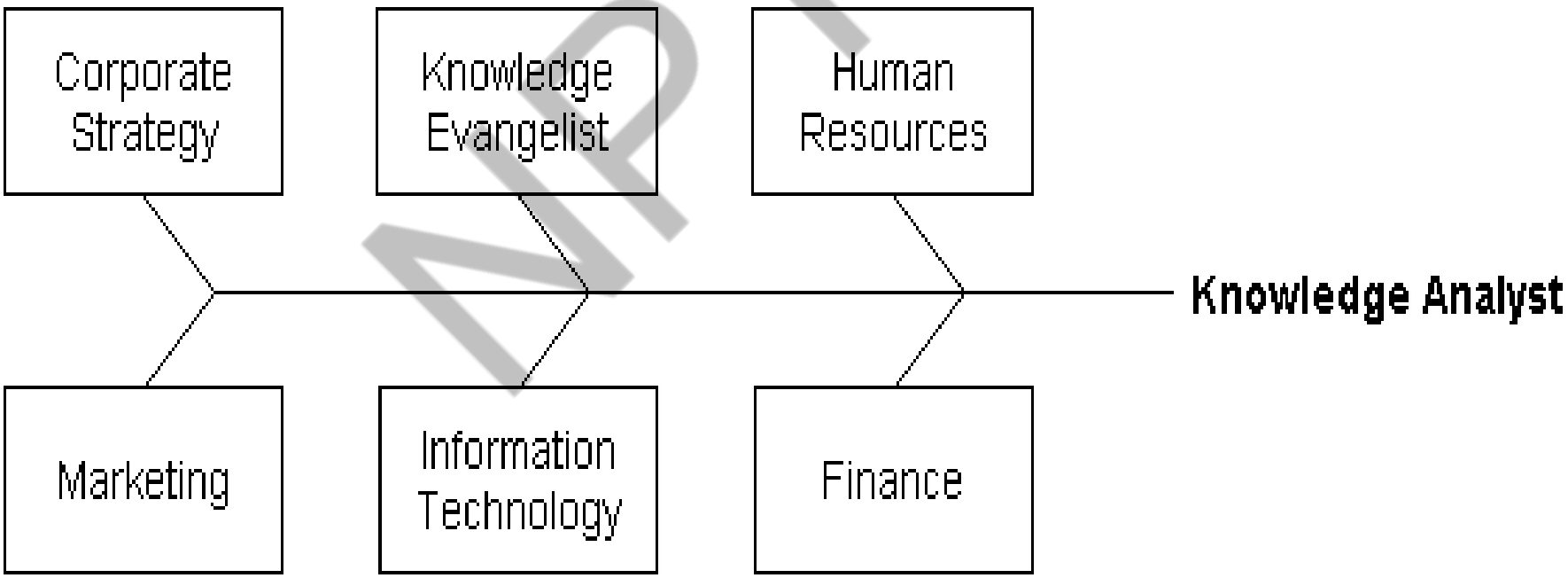
Topics Covered

Design the KM team.

- **Identify sources of requisite expertise.**
- **Identify critical points of failure: requirements, control, management buy-in, and end user buy-in.**
- **Structure the knowledge management team: organizationally, strategically, and technologically.**
- **Balance technical and managerial expertise, manage stakeholder expectations.**
- **Resolve team-sizing issues.**

KM TEAM

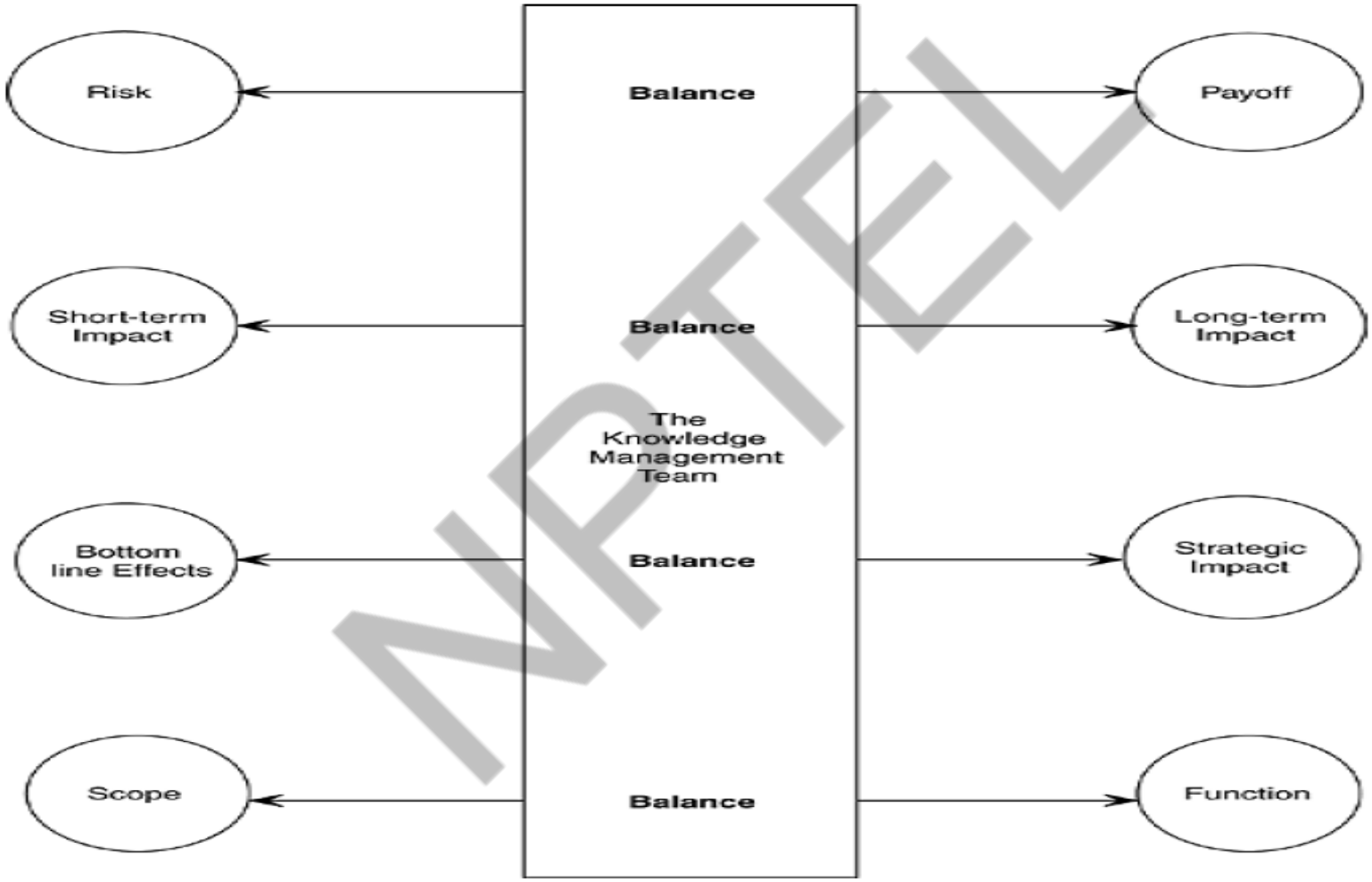
A knowledge management system is built on expertise, knowledge, understanding, skills, and insights brought into the project by a variety of stakeholders who might have little in common from a functional standpoint



Sources of Expertise

- Draw their expertise from several different sources:
  - Internal, centralized IT departments
  - Team-based local experts
  - External vendors, contractors, partners, and consultants
  - End users and front-line staff

The KM team : The right balance



Local Experts and Intradepartmental Experts

- Experts within the company, people who come in early or stay late to play with new tools that become available. More adoptable to technology
- Many of these experts maybe non-technologists, but they can gauge the possible usefulness of each feature of the current system.
- Local experts very often are the first ones to notice the limitations of current and existing systems and think of how to upgrades and make changes to meet the evolving needs of the group.

Internal IT Departments

- It is IT staff who will bring in knowledge of:
  - Infrastructural capabilities and limitations
  - Connectivity and compatibility among the team based systems and the overall organizational technology infrastructure
  - Standardization issues across different platforms, applications and tools
  - Technicalities underlying the adaptation of these tools by various knowledge worker groups within the organization
  - It is critical to select personnel with credibility in the eventual user group.
  - Example- Platinum technology KM system

Nonlocal Experts and Extradepartmental Gurus

- Act as a bridge and as interpreters between people from different backgrounds, skill areas, and specializations.
- Learn faster than the average person.
- Bring value to the overall team synergy.
- Learn the basic lingo and understand the frameworks.
- Have the ability to deal creatively and rationally with the problems

Laterality

- Laterality refers to the ability to cut across functional boundaries and relate to people from different areas. (capability to think divergently)

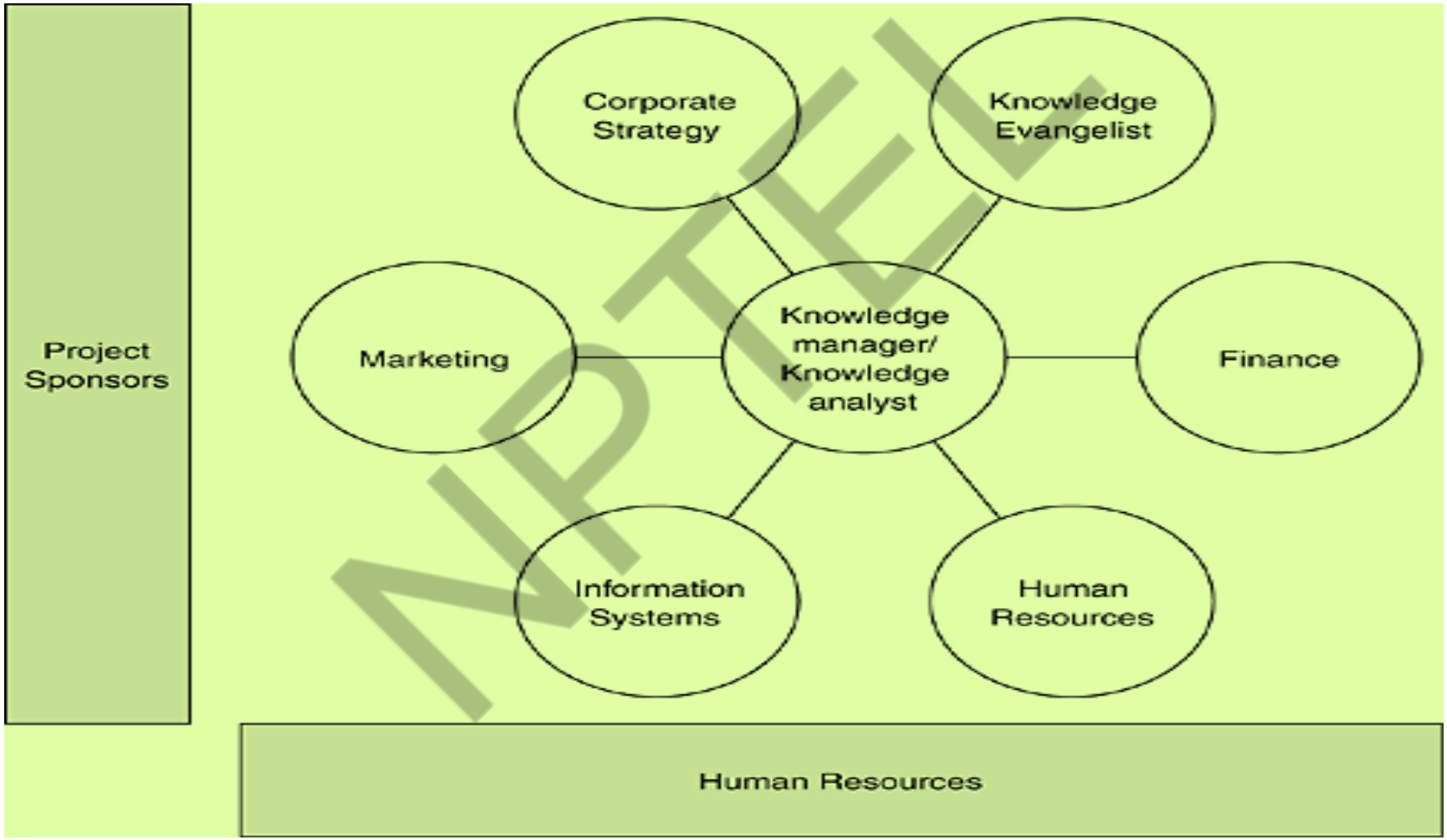
Laterality

- Groups of such people have also been referred to as *communities of practice*; they are characterized by:
  - Multifunctional groups that incorporate diverse viewpoints, training, ages and roles
  - Enacting a common purpose by engaging in real work, building things, solving problems, delivering service, and using real tools
  - Developing intellectual property, knowledge, firm culture, internal language, and new skills
  - Making lasting changes in the people and the competency that they embody

Role of Consultants

- Selection a consultant should, therefore, be based on the extent to which the person is willing to transfer existing skill to company's employees.
- Some of the other issues that must be considered while selecting a consultant include:
  - The consultant's reputation for integrity.
  - The consultant's history that demonstrates the ability to maintain confidentiality about past project.
  - Whether the consultant has worked successfully for your own company on earlier projects.
  - Weather the consultant (or consulting company) is working on a similar project for a competitor.
  - Weather your internal team trusts and has confidence in the consulting company

KM Team Structure



(Source: Tiwana, A.: Knowledge Management Toolkit, 1995)

Structuring the KM team

Focus	Shareholder Group	Role in the Knowledge Management Project	Characteristics Strongly Desired
Teams	User teams Finance Marketing Other functional areas with which the knowledge management initiative is concerned	• Provide functional expertise. • Provide business expertise in their specific area. • Participate in the process design stage. • Help in the implementation stages of the system.	• Must understand work processes in their area. • Must have good interpersonal and team skills. • Must have a certain degree of credibility within other participating groups. • Must be willing to see from other functional viewpoints.

(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Structuring the KM team

Focus	Shareholder Group	Role in the Knowledge Management Project	Characteristics Strongly Desired
Technology	IT experts/information systems Internal IT staff External consultants	• Provide technology expertise. • Participate in the actual implementation and design. • Represent the internal and internally proficient technologists. • Actually write the code. • Bring in a perspective on functional capabilities and limitations of existing systems.	• Must understand technology in depth. • Must have good interpersonal skills. • Must have strong team skills. • Must be willing to understand the perspectives brought in by other team members and actually incorporate them into the design. • Must be willing to learn. • Must be credible. • Must have an expansive customer orientation.

(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Structuring the KM team

Focus	Shareholder Group	Role in the Knowledge Management Project	Characteristics Strongly Desired
Organizational	Senior management/sponsors/ knowledge champion(s)/CKO	• Support the legitimacy of the project. • Bring in vision that correlates with the overall company-wide vision. • Serve on steering committees (if needed). • Commit the resources needed.	• Understand the management and strategic processes. • Must be credible. • Must have a strong leadership position that almost everyone on the team accepts. • Must have a clear idea of the bigger picture of where knowledge leveraging should take the company. • Must "eat their own dog food," that is, they must themselves believe what they say. • Need to be thoroughly convinced of the worth of the project.

(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Composition of the Team and Selection Criteria

- Cross-Functional expertise (diversity) in KM teams should be taken as a given characteristics.
- Teams need to be designed for effectiveness.
- Team's design has much to do with the nature of the project itself.
- Functional diversity can lead to only two possible outcomes, depending on how it's handled.
  - The first and common outcome is destructive conflict and tension.
  - The second, more desirable outcome is characterized by synergy, creativity and innovation.

Designing the KM Project team

Team Design Element	Characteristics of the Knowledge Management Team Members Selected	Notes
Defining the knowledge management project leader's role	The leader of the team: • Must be credible. • Must have a sufficient level of authority and resource capability. • Should not change; must be stable. • Must know how to facilitate, consult, and resolve conflicts. • Must take charge of the conventional project management, scheduling, and coordination duties. • Must have direct reporting capability to upper management or should be drawn from within upper middle management. • Must manage the life cycle of the team, as well as selection of the core team members. • Must encourage structured decision making. • Must be experienced in both complex projects and in various roles within the company.	These criteria can be also used for selecting the project leader.

(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Designing the KM Project team

Team Design Element	Characteristics of the Knowledge Management Team Members Selected	Notes
Defining the team composition and selection criteria for team members	Knowledge management project team members must be drawn from different functional areas and departments of the firm. As expected, they will have different areas of specialization and backgrounds. The following common characteristics must be shared by members selected for the team: • Must have specialized expertise. • Must have had sufficient experience within the company or working with the company as an external consultant. • Must have the required competencies that truly represent the concerns of the department or functional area that the team member represents. • Might work full time or part time on this project. • Might be a member of the core team or the temporary startup team. • Must demonstrate laterality. • Must believe in the project and must have a clear vision for what improved knowledge flows can and should do for this unit or department.	All groups that will be affected by the knowledge management project and, conversely, all groups that are expected to use and contribute to this knowledge and knowledge management efforts must be adequately and accurately represented in the team.

(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Temporary Versus Permanent Team Members

- A KM project needs at least a small portion of the group to be permanent.
- The core team should consist of only the following participants:
  - Knowledge champion or a senior manager.
  - IT staff.
  - User delegates representing the core business area that is going to depend on the KM system.

Team Life Span & Sizing Issues

- There are two schools of thought on the future of KM.
  - KM will continue to depend on people to manage knowledge throughout the lifetime of the organization
  - KM is a self-eliminating field
- Team members on the KM team should be promised strong rewards and promotions if the KM initiative truly succeeds.

The Project Leader

- The KM project leader may or may not be the same person as the CKO.
- KM projects need leadership that helps create a supportive, unobtrusive, and focused environment
- The project leader must track progress, budgets, workloads and schedules
- The KM project leader serves as the visionary
- A project leader must resolve internal dynamics, serve as a translator, and take charge of task delegation

Internal Dynamics

- The project leader plays an essential part here by helping team members understand why even trivially straightforward issues and differences seem to be so difficult to resolve.
- In their facilitating role, project leaders can pose the key questions, clarify differences and their underlying assumptions, then give members of the KM team sufficient room to actually resolve these differences.

Translation and Delegation

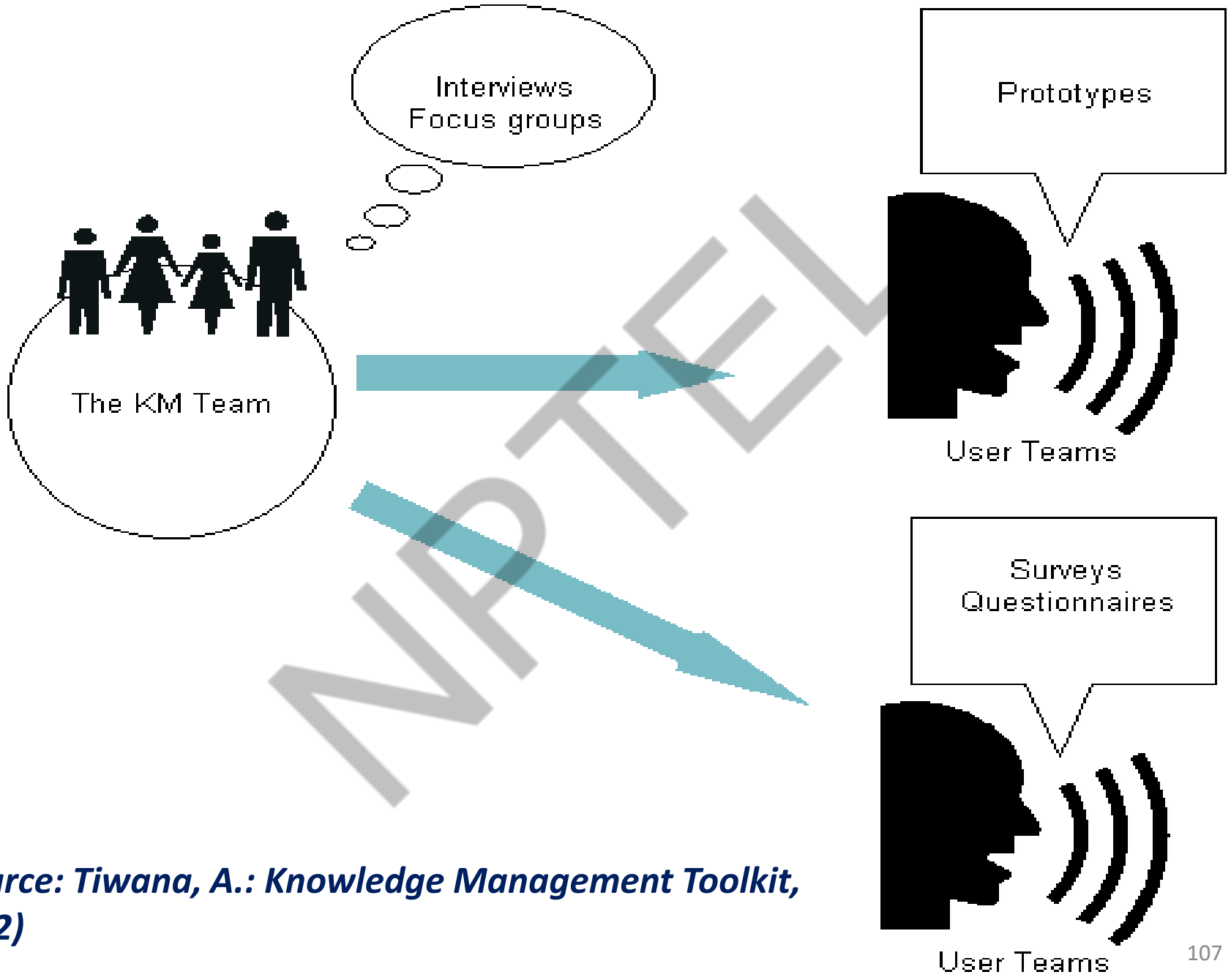
- The project leader also needs to be able to act as translator in the startup stages of the project when the user teams and the IT participants fail to understand each other's viewpoints because of vocabulary differences.
- To determine the actual issues of concern and to identify the actual knowledge flow problems that exist within the company, the project leader should encourage participants to actually collect relevant data from their own department through meetings, surveys, interviews and focus groups.

User Participation

- It is the project manager's role to ensure that the KM project is going in a direction that builds toward a system that users *actually need*.
- One of the most effective ways of verifying this linkage is to show a preliminary version of the KM system to actual users.

Prototypes

- A prototype provides both the developers – in this case, the KM team – and the users with an idea of how the system in its final form will function.
- By using such a prototype, even if it is incomplete, users can see the possibilities of the KM system understanding of the final product can lead to or trigger highly desirable refinement of its features, interface, functionality, and design.



(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

The KM Team's Project Space

- Members of KM team should be able to provide adequate answers to these questions collectively:
  1. What is the company's envisioned strategic and performance goal?
  2. Where does the KM team fit in the organizational hierarchy?
  3. Does the KM project fit vertically or horizontally in the value chain?
  4. What are the financial and time constraints for the project?

The KM Team's Project Space

- Members of KM team should be able to provide adequate answers:
  8. What level of commitment does the team have from the senior management and from the users?
  9. Where are the cultural blockades that should be expected?
  10. Has any competitor or noncompeting firm implemented a project like this?

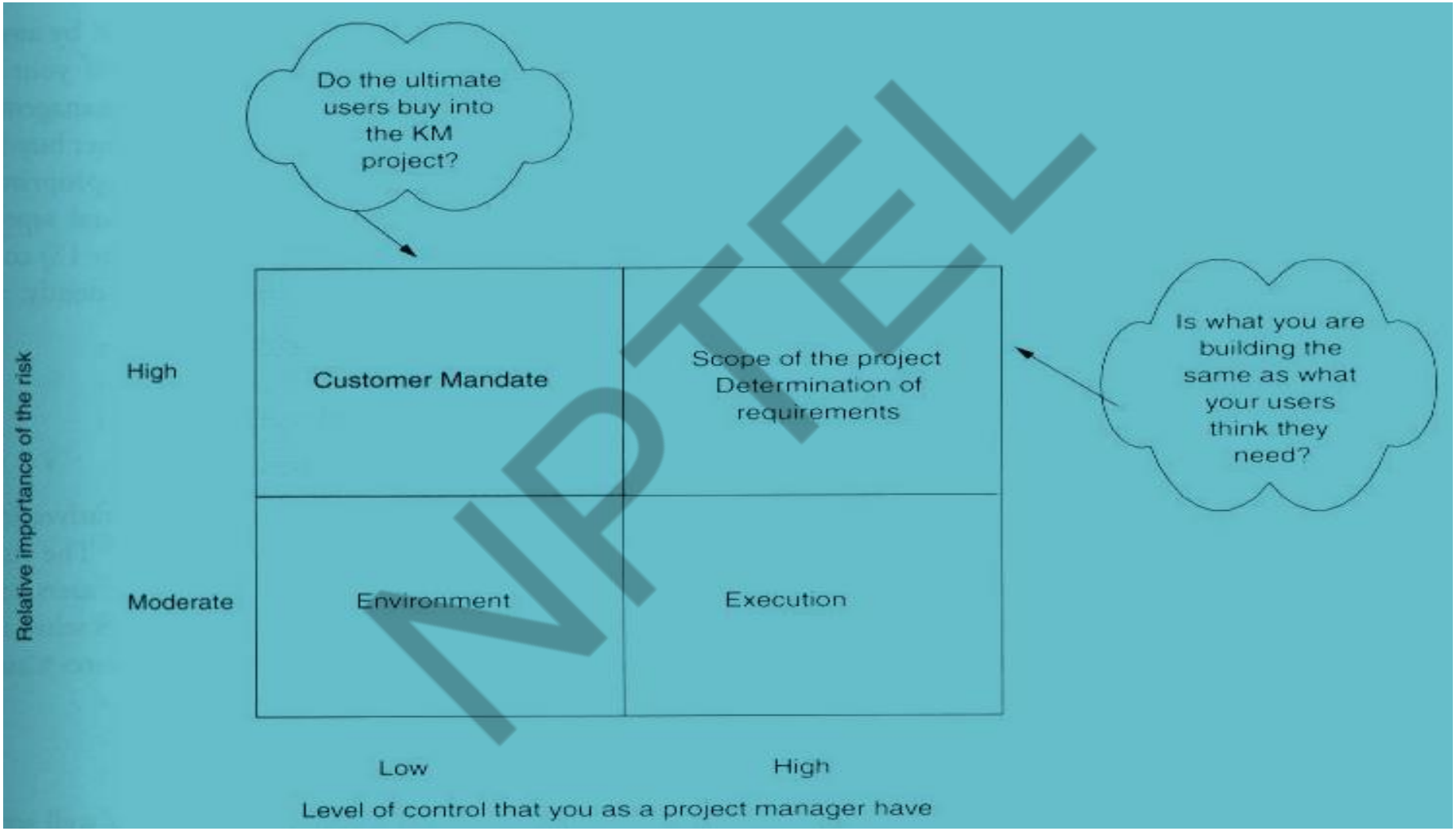
Managing Stakeholder Expectations

- Formally present this work to various stakeholder groups
- Such an interaction can help the team compare the project's objective with stakeholder expectations and perceptions

Highways to Failures

- A survey of 8000 software projects in 400 U.S. firms found that only one in six was successful. Of the remaining, about one third were never complete, and over half were over budget, did not finish on time, or failed to deliver the promised functionality.
- Such failures annually cost U.S. business about $78 billion in development cost, and another $22 billion in cost overrun.
- Lack of an active role of the top management has been identified as the primary reason that many projects fail.
- The second reason is failure of the users to buy in to the project

Categorizing Risks in building KM system



(Source: Tiwana, A.: Knowledge Management Toolkit, 2002)

Controlling and Balancing Requirements

- The only thing you can do about customer buy-in problems is to try selling the project harder and to gauge end-user needs more appropriately; the operating environment is an entirely different story.
- That is where the cultural aspects of a KM system and the people around it come into play.

Solving User Buy-In Problems

- To ensure that senior managers actually buy into the project.
- To ensure that the “bigger-picture” that the management has in mind is well accommodated and incorporated

Lessons Learned

- **Identify a few key core stakeholders**
- **Identify sources of requisite expertise**
- **Select a visionary and experienced project leader**
- **Identify critical failure points**
- **Avoid external consultants if possible**
- **Balance the knowledge management team's managerial and technological structure**