KNOWLEDGE MANAGEMENT

In order to comprehend knowledge management, it is necessary to first understand the concept of knowledge. What is knowledge? How is it different from information? And how is information different from mere data?

We begin with data. What is data? Data is a number or word or letter without any context. For example, numbers like 5 or 100, without any context, are mere data. Without reference to either space or time, these numbers or data are meaningless points in space and time. The key phrase here is "out of context". And since it is out of context then it has no meaningful relation to anything else.

A mere collection of data is not information. This means that if there is no relation between the pieces of data, then it is not information. What makes a collection of data information is the understanding of the relationships between the pieces of data or between the collection of data and other information. In other words, what is essential in making data or a collection of data information is the context, that is, the relation between the pieces of data.

Defining Data, Information, and Knowledge

Data: Facts and figures which relay something specific, but which are not organized in any way and which provide no further information regarding patterns, context, etc. I will use the definition for data presented by Thierauf (1999): "unstructured facts and figures that have the least impact on the typical manager."

Information: For data to become information, it must be contextualized, categorized, calculated and condensed (Davenport & Prusak 2000). Information thus paints a bigger picture; it is data with relevance and purpose (Bali et al 2009).

It may convey a trend in the environment, or perhaps indicate a pattern of sales for a given period of time. Essentially information is found "in answers to

questions that begin with such words as who, what, where, when, and how many" (Ackoff 1999).

IT is usually invaluable in the capacity of turning data into information, particularly in larger firms that generate large amounts of data across multiple departments and functions. The human brain is mainly needed to assist in contextualization.

Knowledge: "Knowledge is a fluid mix of framed experience, values, contextual information, expert insight, and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of the knowers. In organizations it often becomes embedded not only in documents or repositories, but also in organizational routines, practices and norms."

Knowledge is directed and tested information that serves a specific subject, which has been processed, proven, generalized, and improved, so that from the accumulation and specificity of this information we obtain specialized knowledge in a specific subject.

An example: data, information and knowledge

This example uses a bank savings account to show how data, information and knowledge relate to the principal, interest rate and interest.

Data. The numbers 100 or 5%, completely out of context, are just pieces of data. Interest, principal, and interest rate, out of context, are not much more than data as each has multiple meanings which are context dependent.

Information. If I establish a bank savings account as the basis for context, then interest, principal, and interest rate become meaningful in that context with specific interpretations. Principal is the amount of money, $100, in the savings account. Interest rate, 5%, is the factor used by the bank to compute interest on the principal.

Knowledge. If I put $100 in my savings account, and the bank pays 5% interest yearly, then at the end of one year the bank will compute the interest of $5 and add it to my principal and I will have $105 in the bank.

This pattern represents knowledge, which, when I understand it, allows me to understand how the pattern will evolve over time and the results it will produce. In understanding the pattern, I know and what I know is knowledge. If I deposit more money into my account, I know that I will earn more interest, while if I withdraw money from my account, I know that I will earn less interest.

Source: Bellinger, G., "Knowledge Management – Emerging Perspectives", <http://systems-thinking.org/kmgmt/kmgmt.htm> (2004).
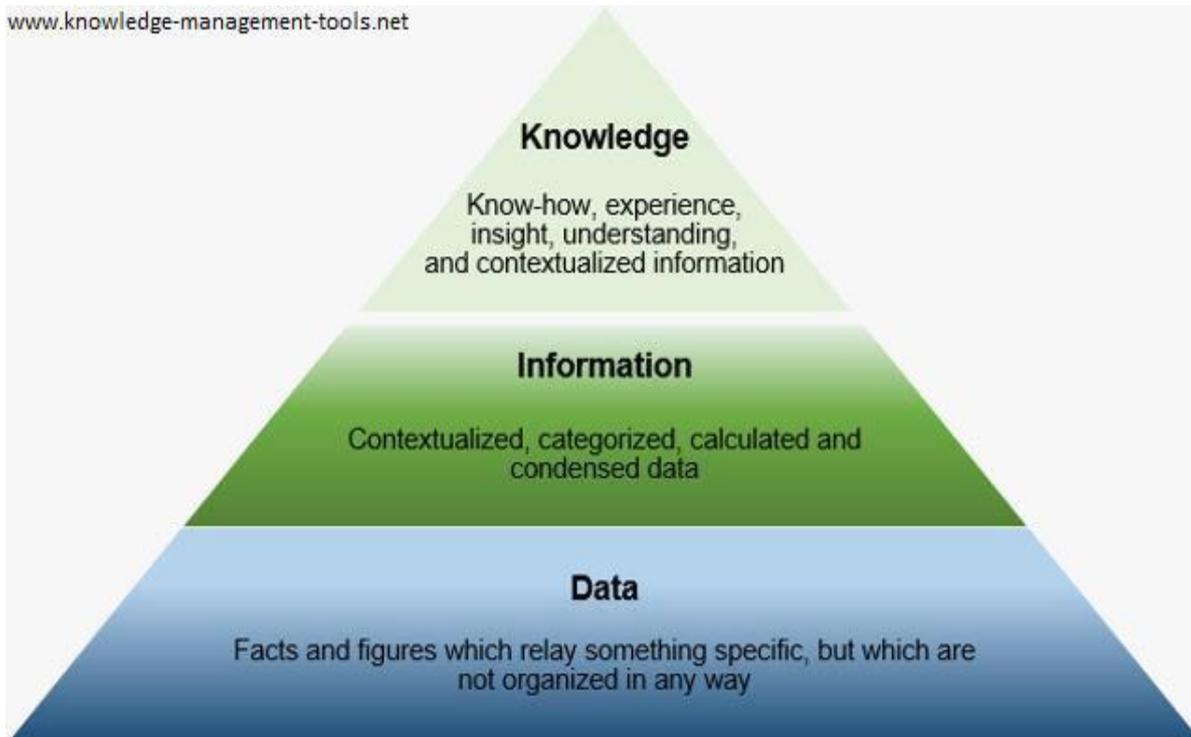
Characteristics of Knowledge

Knowledge has a set of characteristics identified by Hossell and Bell, which can be summarized as follows:

1- **Knowledge can be generated:** Some companies possess intellectual fertility that enables them to generate new knowledge. This is represented by the innovative individuals within the company who are funded in the process of sustaining innovation and renewing knowledge.

2- **2- Knowledge can die or be lost:** Just as knowledge can be generated, it can also die. Only a small portion of the knowledge acquired through our experiences is recorded, and what is written in books and journals represents a very small fraction of our knowledge. Therefore, the vast majority of knowledge dies with the individual. However, the concept of knowledge is unique; some knowledge dies with the death of the person, while other knowledge dies when new knowledge replaces the old, rendering it obsolete. Knowledge can also be lost due to a failure to store it.

3- **Knowledge can be owned:** Due to higher education rates, most knowledge is valuable for increasing corporate wealth.Companies play a significant role in transforming their knowledge into patents or trade secrets, which enjoy legal protection similar to individual property.

4- **- Knowledge is embedded in individuals:** Not all knowledge within a company is explicit and visible. Much organizational knowledge is held in the minds of individuals; there is innate, deeply rooted knowledge.

5- **- Knowledge can be stored:** An organization can store its knowledge in documents, tapes, on computers, etc.

6- **- Knowledge is applicable:** This means that knowledge can be embodied by its owner in their work. - The inexhaustibility of knowledge (it is not subject to depletion): The use of knowledge does not lead to its exhaustion, even if it is transferred to other individuals. The owner will not lose it; on the contrary, their knowledge will increase through the exchange of knowledge with employees. - The reproducibility of knowledge: If an organization can store the knowledge possessed by its employees, it can create multiple copies of it at low cost.

There are also other characteristics of knowledge, including:

7- **- Accumulation:** Knowledge changes and is renewed by adding new knowledge to existing knowledge, so that the knowledge remains valid and usable until it is renewed.

8- **- Comprehensiveness of knowledge:** Knowledge is easily transferred between individuals, relies on convincing and compelling evidence and proofs, and relates to and explains all areas of life.

9- **- Order and organization:** Knowledge is usually ordered and organized in a logical way, unlike information and data, so that it allows the user to benefit from it easily and conveniently.

10- **Causation and Explanation:** Every event has a cause, and our knowledge of causes leads us to accept results. Therefore, knowledge depends on seeking an explanation for everything and understanding the causes of phenomena in order to control them better.

11- **Precision and Abstraction:** This means that the facts in knowledge are based on precision and facts, not conjecture. Mathematical facts can be used in their analysis and expression.

Types of Knowledge:

A- classification of Marquardt:

He categorized knowledge into five types:

Know what: Knowing what type of knowledge is required.

Know how: Knowing how to deal with a phenomenon.

Know why: Knowing why a particular type of knowledge is needed**.**

Know where: Knowing where a specific type of knowledge can be found.

Know when: Knowing when a specific type of knowledge is needed.

B- **Nonaka's classification:** This categorizes knowledge into tacit and explicit knowledge. Nonaka emphasized the importance of this distinction in studying knowledge-creating companies, and this classification is the most widely used.

1- **Explicit knowledge** is knowledge contained in programs, documents, procedures, and policies. It is coded knowledge that can be shared. Nonaka and Takeshi indicate that explicit knowledge is that which can be expressed in words, numbers, and sounds, and is shared in the form of data, scientific formulas, visuals, audio recordings, product specifications, and manuals. Generally, it is knowledge that is easily transferred between individuals formally and systematically.

This type of knowledge is formalized and codified and is sometimes referred to as know-what (Brown & Duguid 1998). It is therefore fairly easy to identify, store, and retrieve (Wellman 2009). This is the type of knowledge most easily handled by KMS, which are very effective at facilitating the storage, retrieval, and modification of documents and texts.
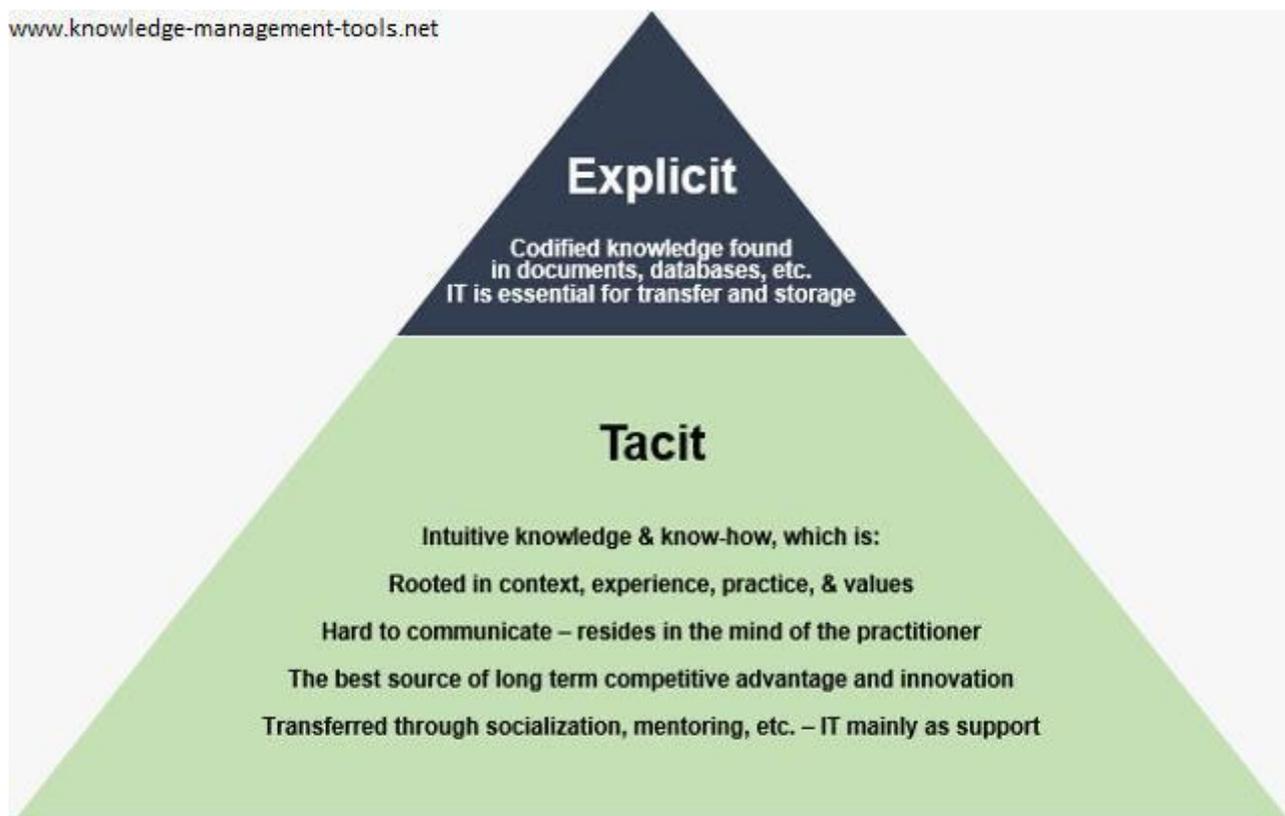
From a managerial perspective, the greatest challenge with explicit knowledge is similar to information. It involves ensuring that people have access to what they need; that important knowledge is stored; and that the knowledge is reviewed, updated, or discarded.

2- **Tacit knowledge;** Tacit knowledge is personal. It is stored in the heads of people. It is accumulated through study and experience. It is developed through the process of interaction with other people. Tacit knowledge grows through the practice of trial and error and the experience of success and failure.

This type of knowledge was originally defined by Polanyi in 1966. It is sometimes referred to as know-how (Brown & Duguid 1998) and refers to intuitive, hard to define knowledge that is largely experience based. Because of this, tacit knowledge is often context dependent and personal in nature. It is hard to communicate and deeply rooted in action, commitment, and involvement (Nonaka 1994).

Some tacit knowledge can be transformed into explicit knowledge through observation, practical experience, and documentation in publications and brochures, thus becoming information. Therefore, some organizations adopt incentive systems to encourage individuals to share knowledge and utilize the knowledge of others.

The two types of knowledge are complementary, and achieving goals is often linked to their coexistence. This explains the possibility of moving from tacit to explicit knowledge, or from tacit to other tacit knowledge, depending on an individual sharing their technical knowledge with others and exchanging experiences, attitudes, skills, and practices. Explicit knowledge can also be transformed into other explicit knowledge, or new knowledge can be generated using explicit knowledge.

www.knowledge-management-tools.net

Explicit
Codified knowledge found in documents, databases, etc.
IT is essential for transfer and storage

Tacit

Intuitive knowledge & know-how, which is:

Rooted in context, experience, practice, & values

Hard to communicate – resides in the mind of the practitioner

The best source of long term competitive advantage and innovation

Transferred through socialization, mentoring, etc. – IT mainly as support

Another type of knowledge can be stated as a type of knowledge is called:

3- Embedded Knowledge

Embedded knowledge refers to the knowledge that is locked in processes, products, culture, routines, artifacts, or structures (Horvath 2000, Gamble & Blackwell 2001). Knowledge is embedded either formally, such as through a management initiative to

formalize a certain beneficial routine, or informally as the organization uses and applies the other two knowledge types.

Embedded knowledge is found in: rules, processes, manuals, organizational culture, codes of conduct, ethics, products, etc. It is important to note, that while embedded knowledge can exist in explicit sources (i.e. a rule can be written in a manual), the knowledge itself is not explicit, i.e. it is not immediately apparent why doing something this way is beneficial to the organization.

COMPARISON OF PROPERTIES OF TACIT VS. EXPLICIT KNOWLEDGE

difference	Tacit knowledge	Explicit knowledge
Possession	The individual possesses it unintentionally.	The individual possesses it intentionally.
Its comprehensibility:	It is not well understood because it is difficult to express, and sometimes difficult to write down.	It is understandable because it can be expressed in writing, numbers, shapes, and other ways.
Extraction	Extracting it from its source is difficult.	Extracting it from its source is easy.
Sharing and Transmitting Information	It can be shared through discussions and personal interactions.	It can also be shared from written guidelines, procedures, and online programs.
Its nature:	Informal and unstructured knowledge.	Formal and structured knowledge.
Its source:	People's minds and the organization's memory.	Documents, computer programs, and databases.
Documenting it	It cannot be documented, and even if it could, it would be a difficult process.	It can be documented or recorded.
Examples include:	personal experiences and skills embedded in people's minds and memories;	research findings reports; and other documents that can be previously recorded.

	instruction manuals;	

Properties of Tacit Knowledge	Properties of Explicit Knowledge
- Ability to adapt, to deal with new and exceptional situations - Expertise, know-how, know-why, and care-why - Ability to collaborate, to share a vision, to transmit a culture - Coaching and mentoring to transfer experiential knowledge on a one-to-one, face-to-face basis	- Ability to disseminate, to reproduce, to access and to reapply throughout organizations - Ability to teach, to train - Ability to organize, to systematize; to translate a vision into a mission statement, into operational guidelines - Transfer of knowledge via products, services, and documented processes

Knowledge sources:

There are two sources for acquiring and developing knowledge within an organization: internal and external.

1. Internal Sources: Tacit knowledge is considered an internal source of knowledge acquisition. Tacit knowledge includes individuals' experiences, beliefs, assumptions, memories, and recollections. This type of knowledge is often difficult to transfer and explain, yet it can offer numerous benefits to the organization.

2. External Sources: There are numerous external sources from which an organization can acquire knowledge. These sources include: following the example of other organizations, participating in conferences, hiring experts, monitoring newspapers, magazines, and online materials, watching television and videos, observing economic, social, and technological trends, gathering information and data from customers, competitors, and suppliers, collaborating with other organizations, forming alliances and joint ventures, and other sources.
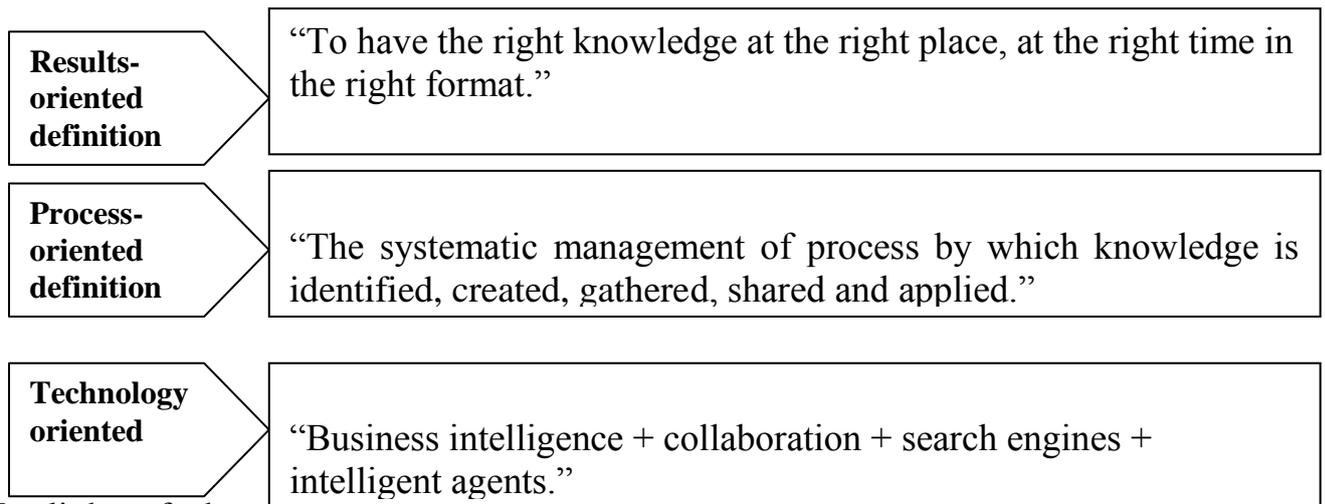
KNOWLEDGE MANAGEMENT :

There are many definitions of KM as follows :
- It is defined as: "A systematic process for searching for, selecting, organizing, and classifying information in a way that increases the level of employee understanding of it, stores it in a way that improves the organization's intelligence, provides it with the necessary flexibility in work, preserves intellectual assets from loss, and

facilitates their use in solving work problems, in learning, strategic planning, and decision-making."

- KM is about making the right knowledge available to the right people. It is about making sure that an organization can learn, and that it will be able to retrieve and use its knowledge assets in current applications as they are needed. In the words of Peter Drucker it is "the coordination and exploitation of organizational knowledge resources, in order to create benefit and competitive advantage"

- It is a collaborative and integrated approach to the creation, capture, organization, access and use of an enterprise's intellectual assets.

- It is the systematic management of an organization's knowledge assets for the purpose of creating value and meeting tactical & strategic requirements; it consists of the initiatives, processes, strategies, and systems that sustain and enhance the storage, assessment, sharing, refinement, and creation of knowledge.

Results-oriented definition	"To have the right knowledge at the right place, at the right time in the right format."
Process-oriented definition	"The systematic management of process by which knowledge is identified, created, gathered, shared and applied."
Technology oriented	"Business intelligence + collaboration + search engines + intelligent agents."

In light of the above, we can say that *knowledge management is a set of interconnected processes for collecting data and information and creating new knowledge through acquiring, storing, retrieving, sharing, and applying knowledge among members of the organization in order to achieve its competitive advantage.*

Difference between Knowledge management and Information Knowledge:

Information and IM:	Knowledge and KM:
● Focus on data and information	● Focus on knowledge, understanding, and wisdom
● Deal with unstructured and structured facts and figures.	● Deal with both codified and uncodified knowledge. Uncodified knowledge - the
● Benefit greatly from technology, since	

the information being conveyed is already codified and in an easily transferrable form.

● Focus on organizing, analyzing, and retrieving - again due to the codified nature of the information.

● Is largely about know-what, i.e. it offers a fact that you can then use to help create useful knowledge, but in itself that

● fact does not convey a course of action (e.g. sales of product x are up 25% last quarter).

● Is easy to copy - due to its codified and easily transferrable nature.

most valuable type of knowledge - is found in the minds of practitioners and is unarticulated, context-based, and experience-based.

● Technology is extremely useful, but KM's focus is on people and processes. IT is great for transferring explicit, codified knowledge, but it's role in the transfer of deeper, internalized knowledge is more complex. Since this kind of knowledge is passed from person to person, through interaction, collaboration, mentoring, etc. and preferably in an unstructured environment, IT tools for KM have to support this function. They are therefore not merely passing on information, but also act as tools to bring people together, to enhance communication, to allow the storage and transfer of unstructured thoughts and notes, etc.

● Focus on locating, understanding, enabling, and encouraging - by creating environments, cultures, processes, etc. where knowledge is shared and created.

● Is largely about know-how, know-why, and know-who

● Is hard to copy - at least regarding the tacit elements. The connection to experience and context makes tacit knowledge extremely difficult to copy. This is why universities cannot produce seasoned practitioners - there are some things (the most important things) that you simply cannot teach from a textbook (or other codified source of information/explicit knowledge). These

	are learnt in the field and understood on an intuitive level. You cannot easily copy or even understand this intuition without the right experience, context, etc. - and it is this intuition that represents the most valuable organizational knowledge.

Why is Knowledge Management Useful?

Knowledge management is of paramount importance at the individual, team, and organizational levels because it is the primary resource for knowledge utilization. Therefore, we will highlight the importance of knowledge management in the following points:

- Knowledge management is an effective way to leverage an organization's intellectual capital by facilitating access to and use of knowledge by those who need it;
- It presents a significant opportunity for organizations to reduce costs, increase knowledge assets, and enhance product quality;
- It motivates organizations to foster the creative potential of their human resources and direct efforts toward generating new knowledge and uncovering previously unknown and obscure relationships.
- It helps firms learn from past mistakes and successes.
- It better exploits existing knowledge assets by re-deploying them in areas where the firm stands to gain something, e.g. using knowledge from one department to improve or create a product in another department, modifying knowledge from a past process to create a new solution, etc.
- It promotes a long-term focus on developing the right competencies and skills and removing obsolete knowledge.
- It enhances the firm's ability to innovate.
- It enhances the firm's ability to protect its key knowledge and competencies from being lost or copied.

In other words Knowledge management provides benefits to individual employees, to communities of practice, and to the organization itself. This three-tiered view of KM helps emphasize why KM is important today

For the individual, KM:

_ Helps people do their jobs and save time through better decision making and problem solving.

_ Builds a sense of community bonds within the organization.

_ Helps people to keep up to date.

_ Provides challenges and opportunities to contribute.

For the community of practice, KM:

_ Develops professional skills.

_ Promotes peer-to-peer mentoring.

_ Facilitates more effective networking and collaboration.

_ Develops a professional code of ethics that members can follow.

_ Develops a common language.

For the organization, KM:

_ Helps drive strategy.

_ Solves problems quickly.

_ Diffuses best practices.

_ Improves knowledge embedded in products and services.

_ Cross-fertilizes ideas and increases opportunities for innovation.

_ Enables organizations to stay ahead of the competition better.

_ Builds organizational memory.

Elements of Knowledge Management

The elements of a successful KM system are generally organized into four major pillars, with Strategy serving as the overarching directional element.

- **People (Cultural and Social)** The human factor is arguably the most critical component, as knowledge resides primarily in people, and its sharing is a voluntary, social act,

  - 1. *Organizational Culture:* A culture of trust, openness, and learning is essential. Employees must feel comfortable sharing their expertise and admitting mistakes (lessons learned) without fear of reprisal

  - 2. *Leadership and Sponsorship:* Senior management must visibly champion the KM initiative, providing the necessary resources, and modeling knowledge-sharing behavior to institutionalize KM

  - 3. *Incentives and Recognition:* Organizations must implement formal and informal rewards, such as linking KM contributions to performance metrics or providing public recognition, to encourage high-quality knowledge contributions and active participation (APQC, Best Practices Reports).

- 4. ***Communities of Practice (CoPs):*** These are groups of people who share a passion for a topic and interact regularly to deepen their knowledge, acting as a critical, informal mechanism for sharing tacit knowledge

- **Process (Operational)** : This element involves defining and standardizing the steps and workflows that govern how knowledge is handled throughout the KM cycle: creation, storage, sharing, and application

- 1. ***Knowledge Capture and Creation:*** Systematic methodologies, such as After-Action Reviews (AARs) or project debriefs, must be established to prevent the loss of critical project and institutional knowledge when personnel move or leave the company

- 2. ***Knowledge Validation and Curation***: Workflows must be in place to review, verify, and update knowledge content regularly. This step ensures the accuracy, relevance, and applicability of the knowledge assets before they are used for decision-making

- 3. ***Workflow Integration***: KM use should be mandatory, not optional, which is best achieved by integrating knowledge retrieval and application directly into daily operational processes, such as customer support or engineering design

- 4. ***Measurement and Evaluation:*** Organizations must define specific Key Performance Indicators (KPIs) to measure KM's direct impact on business outcomes, such as reduced time-to-market for products or lower operational costs

- **Technology:** (Enabling Infrastructure) Technology provides the infrastructure required to efficiently codify, store, search, and transfer knowledge across the enterprise, offering scale and speed that people alone cannot achieve.

- *1. Knowledge Repositories:* These are the centralized, structured systems (databases, wikis, content management systems) used for storing and archiving explicit knowledge like reports, manuals, and documented best practices

- *2. Advanced Search Functionality:* Sophisticated search engines and intelligent tagging systems are necessary to help users quickly and accurately find the right information amidst a vast pool of data

- *3. Collaboration Platforms:* Tools like internal social networks, discussion forums, and instant messaging facilitate real-time interaction and exchange, supporting the sharing and externalization of tacit knowledge among peers

- **Content:(The Asset)** This element refers to the intellectual assets themselves—the actual knowledge—which must be highly organized to be usable.

- *1. Taxonomy and Classification:* Structured categorization schemes (taxonomies) must be developed to organize content logically. This structure improves the ability to browse content and significantly enhances search precision

- *2. Content Quality:* The knowledge assets must be accurate, concise, and presented in usable formats (e.g., templates, visual guides). Obsolete or low-quality content must be periodically retired to maintain trust in the system (APQC, Best Practices Reports).

- *3. Source Identification:* It is crucial to clearly document the origins, context, and ownership (or subject matter expert) of the knowledge content, adding context and credibility .

- **Strategy and Governance (The Directional Element**) This ensures all KM activities are aligned with the organization's mission and are managed by a clear, formal framework.

- *1. Strategic Alignment:* KM goals must be derived directly from and support critical business objectives, such as accelerating R&D or improving customer retention. KM must solve specific business problems to justify its investment.

- *2. Governance Structure*: Establishing formal roles, responsibilities, and a steering committee is necessary to oversee the KM program, set policies, manage budgets, and arbitrate content disputes across different business units.

Knowledge management processes

Knowledge management is formed as a result of a number of processes that lead to an understanding of knowledge management and how it is best implemented within an organization. Most researchers in the field of knowledge management indicate that knowledge derived from information, both internal and external, is meaningless without the processes that nourish it, enable access to it, facilitate sharing, store it, distribute it, maintain it, and retrieve it for application or reuse.

Knowledge management processes operate sequentially and are integrated with each other, with each process building upon and supporting the previous one. Knowledge management processes can be summarized as follows:

● Knowledge Discovery & Detection
●
● Knowledge Sharing
● Knowledge Reuse

● Knowledge Creation
● Knowledge Acquisition

- **Knowledge Diagnosis**

Knowledge diagnosis is crucial in any knowledge management program. Based on this diagnosis, policies and other operational programs are developed. One of the outcomes of the diagnostic process is identifying the types of knowledge available, and by comparing them to the required knowledge, gaps can be identified. The diagnostic process is essential because its goal is to discover the organization's knowledge, identify the individuals who possess it and their positions, and determine where this knowledge is located within the organization's databases. The diagnostic process is one of the most significant challenges facing business organizations because the success of a knowledge management project depends on the accuracy of the diagnosis.

- **Knowledge Generation**
    This is the process of creating or acquiring new knowledge. It is a combination of several overlapping and integrated processes, starting with Capturing, Buying, Creating, Discovering, Absorption, and Acquiring. " **Buying** means obtaining knowledge through direct purchase or through employment contracts. **Absorption** refers to the ability to understand and assimilate explicit knowledge. **Capturing** means acquiring tacit knowledge residing in the minds of creators. **Creating** refers to generating new, undiscovered, and uncopied knowledge. **Discovery** refers to identifying existing knowledge. Takeuchi and Nonaka indicated that knowledge generation leads to its expansion through two sets of dynamics: when organizations generate and utilize knowledge through a process called "knowledge transformation," which is:
    A- Transforming tacit knowledge To understand the phenomenon.
    B- Transferring knowledge from the individual level to the collective level through sharing.
This model consists of the following patterns :
1. **Socialization**: This is the generation of tacit knowledge, meaning the transformation of knowledge from tacit to tacit. It allows for the exchange of experiences and skills and the acquisition of tacit knowledge through observation. Trainees work with instructors and learn the craft not by speaking but by observing. In organizations, training uses the same principle.
2. **The externalization**: This is the generation of explicit knowledge through the transformation from implicit to explicit. Through dialogue, implicit knowledge

becomes explicit knowledge, where the use of concepts, language, metaphors, models, etc., are important methods for the entire process of creating explicit knowledge.

3. **Combination**: It is the generation of explicit knowledge, and it is based on transforming explicit knowledge into explicit knowledge through language, forms, documents, media, and telephone. Information technology is very effective in this method, which has encouraged significant progress in the field of knowledge management using this method.

4. **Internalization:** It is the generation of tacit knowledge, and it is based on transforming knowledge from explicit to tacit. This is achieved through repeated performance of the task, where explicit knowledge becomes as easily absorbed as tacit knowledge. Input is a process of embodying explicit knowledge (embodiing knowledge) and is closely related to learning by doing.

- **Knowledge Storage:** The process of knowledge storage relates to the processes of retention, maintenance, encoding, accessibility, security, formality, protection, and retrieval.

    The process of knowledge storage allows for the representation, encoding, and organization of knowledge in various accessible formats. It also enables the uploading and transfer of knowledge, allowing the results of existing knowledge to be made available to others both within and outside the organization. Organizations store both old and new knowledge, whether through traditional paper-based methods or modern computer-based techniques, to enable them to utilize and retrieve knowledge as needed. Information and knowledge management cannot rely solely on the memory of individual members due to limitations in human memory. Furthermore, organizations should not store all knowledge, but only that which is valuable, reliable, and relevant. The knowledge storage process encompasses all operations, including retention, searching, access, retrieval, and location. Information technology is crucial in improving the efficiency of knowledge storage processes, particularly for virtual knowledge.

- **Knowledge Sharing :** Knowledge sharing can be described as either push or pull. The latter is when the knowledge worker actively seeks out knowledge sources (e.g. library search, seeking out an expert, collaborating with a coworker etc.), while knowledge push is when knowledge is "pushed onto" the user (e.g. newsletters, unsolicited publications, etc.).

The concepts of knowledge sharing according to the different types of knowledge:

a- Explicit Knowledge Sharing :

Successful explicit knowledge sharing is determined by the following criteria:

● Articulation: The ability of the user to define what he needs.

● Awareness: Awareness of the knowledge available. The provider is
encouraged to make use of directories, maps, corporate yellow pages, etc.

● Access: Access to the knowledge.

● Guidance: Knowledge managers are often considered key in the build-up of a knowledge sharing system.). They must help define the areas of expertise of the members of the firm, guide their contributions, assist users, and be responsible for the language used in publications and other communication material. This is so as to avoid an information/knowledge overload.

● Completeness: Access to both centrally managed and self-published knowledge. The former is often more scrutinized but takes longer to publish and is not as hands-on (and potentially relevant). Self-published information on the other hand runs the risk of not being as reliable.

IT is useful in most stages of the knowledge sharing process, and it is used for content management as well as data and text mining.

IT may be used to:

● Import and create documents and multimedia material.

● Identify key users and their roles.

● Assign roles and responsibilities to different instances of content categories or types.

● Define workflow tasks. Content managers can be alerted when changes in content are made.

● Track and manage multiple versions of content.

● Publish content to a repository to support access. Increasingly, the repository is a part of the system, incorporating search and retrieval. Document management systems use numerous advanced indexing, searching, and retrieval mechanisms (e.g. using meta data or content from the actual document) to facilitate explicit knowledge sharing.

b- Tacit Knowledge Sharing

Sharing tacit knowledge requires socialization. This can take many different forms. Davenport & Prusak (2000) outline a few relevant factors:

● Informal networks, which involve the day to day interaction between people within work environments are considered very important

● Unlike the formalized structure of the firm, these networks span functions and hierarchies. They are therefore difficult to identify and monitor.

● Management should support these networks by providing the means for communication. Japanese firms have created talk rooms where employees can engage in unstructured, unmonitored discussions. A specific location is useful but not mandatory - this process also occurs in cafeterias etc. Management must simply provide the means for employees to foster informal networks and "trade" tacit knowledge.

● Management must also understand the value of chaos. This refers to the value of unstructured work practices that encourage experimentation and social interaction. Within a more chaotic environment, individuals are given the freedom to solve problems creatively and, in so doing, must tap into and evolve their social networks. This is closely linked to the notion of theory in use vs espoused theory. The value of less structured work environments is also well known within innovation management.

Codification of tacit knowledge is difficult and sometimes outright impossible. There will often be a resulting knowledge loss. Often, it is much more reasonable to simply externalize the sources of tacit knowledge rather than the knowledge itself. This means that often it is better for experts to externalize what they know rather than how they know it. The main role of KM then becomes making sure that experts can be found so that tacit knowledge can be passed on through practice, mentoring, and networking (socialization), and that the firm supports and encourages the networking that is necessary for these functions to occur.

Tacit Knowledge Sharing and IT

It is important for tacit sharing of knowledge to be people focused. However, increasingly, IT systems are becoming useful in this area as well. They can support interaction between people that are not in the same location and some tools are designed to capture unstructured thoughts and ideas. The important factor to remember is that tacit knowledge cannot always be made explicit (and may lose some of its richness in the process). Therefore, IT systems should not attempt or pretend that they can carry out this process, but instead act as an important support to existing practices.

Characteristics of Knowledge Sharing	Explicit knowledge	Tacit knowledge
Characteristics	Codified knowledge found in documents, databases, etc. Easy to share, modify, and copy.	Intuitive, knowledge rooted in context & practice. Difficult to articulate, share, modify, and copy.
Management	Organize, categorize, refine, & share.	Common practice, mentoring, apprenticeships, project teams, informal networks, chaos, etc.
Use of IT	Very useful for storage, transfer, and combination.	Moderate – with careful implementation.

- **Knowledge Application**

This includes the processes of Use, Reuse, Utilization, and Application. Successful management is that which uses available knowledge management in a timely manner, while investing in the opportunity it presents to achieve an advantage or to solve an existing problem.

Knowledge Management Components

Knowledge management comprises four components:

1. **Content:** This defines the information that can be included within the intellectual and knowledge-based elements that play a prominent role in developing organizational performance.

2. **Technology**: This involves developing the computer components and software used to deliver the required tasks.

3. **Processes**: This involves outlining the procedures that need updating and development to ensure that knowledge management aligns with user needs in terms of quality, quantity, and relevance to the subject matter.

5. **People**: Organizations encourage their human resources to create, share, and utilize knowledge because of their ability to respond quickly to customers, create new markets, rapidly develop new products, and master modern technology. The primary reason for their success is the approach they use to manage the creation of new knowledge.

Knowledge Management Models

There are numerous knowledge management models. These models vary depending on the nature of the organization's work and the approach it adopts. These models incorporate the essential elements of knowledge management: strategy, people, and technology.

These models aim to build knowledge strategies that help organizations achieve their goals by solving their problems and leveraging their employees to reach a stage of innovation and competitiveness.

A- Duffy's Model

Duffy proposed a knowledge management model based on this model; Knowledge = Information + Energy (the energy an organization acquires from its external environment). Through the combined efforts of strategy, people, processes, and technologies, this information and energy are transformed into knowledge, processes, and structures that produce goods and create value for the organization. Knowledge management is a process that involves acquiring both tacit and explicit knowledge, supporting and reinforcing business operations, generating returns, emphasizing the human element as its core component, and learning lessons through the repeated use of knowledge. According to this model, the processes are as follows:

1- **Knowledge Acquisition:** This includes acquiring explicit and tacit knowledge, capturing existing knowledge, and generating new knowledge.
2- **Knowledge Organization**: Classifying, categorizing, coding, and storing knowledge.
3- **Knowledge Retrieval**: Retrieving stored knowledge when needed
4- **Knowledge Distribution**: Sharing and transferring knowledge.
5- Knowledge Maintenance: This includes revision, growth, and feedback.

Therefore, knowledge management, through its processes, is compelled to achieve the necessary adaptation of the organization to its external environment. This enables it to overcome various rapid changes and respond to evolving requirements, in order to avoid threats and seize opportunities.

B- The Wiig Model for Building and Using Knowledge

Wiig (1993) approached his KM model with the following principle: in order for knowledge to be useful and valuable, it must be organized. Knowledge should be organized differently depending on what use will be made of the knowledge. For example, in our own mental models, we tend to store our knowledge and know-how in the form of semantic networks. We can then choose the appropriate perspective based on the cognitive task at hand.

Knowledge organized within a semantic network can be accessed and retrieved using multiple-entry paths that map onto different knowledge tasks to be completed. Some useful dimensions to consider in Wiig's KM model include: (1) completeness, (2) connectedness, (3) congruency, and (4) perspective and purpose.

- *Completeness* addresses the question of how much relevant knowledge is available from a given source. Sources may be human minds or knowledge bases (i.e., tacit or explicit knowledge). We first need to know that the knowledge is out there. The knowledge may be complete in the sense that all that is available about the subject is there, but if no one knows of its existence and/or availability, they cannot make use of this knowledge.
- *Connectedness* refers to the well-understood and defined relations between the different knowledge objects. Very few knowledge objects are totally disconnected from the others. The more connected a knowledge base is (i.e., the greater the number of interconnections in the semantic network), then the more coherent the content and the greater its value.
- A knowledge base is said to possess *congruence* when all the facts, concepts, perspectives, values, judgments, and associative and relational links between the knowledge objects are consistent. There should be no logical inconsistencies, no internal conflicts, and no misunderstandings. Most knowledge content will not meet such ideals where congruency is concerned. However, concept definitions should be consistent, and the knowledge base as a whole needs to be constantly "fine-tuned" to maintain congruency.
- *Perspective and purpose* refer to the phenomenon through which we "know something" but often from a particular point of view or for a specific purpose.

We organize much of our knowledge using the dual dimensions of perspective and purpose (e.g., just-in-time knowledge retrieval or just enough—"ondemand" knowledge).

C- Lindsey's Knowledge Management Model

Lindsey views knowledge management success from a balanced scorecard perspective and proposes a knowledge management effectiveness model. This model integrates organizational competency theory and situational theory.

This model identifies two key elements for measuring the effectiveness of the system:
- **The quality of the knowledge infrastructure**: which comprises two main aspects: the social and the technical;
- **The quality of knowledge processes**: which focuses on the integration of the various knowledge management processes.

The effectiveness of a knowledge management system depends on two fundamental and complementary elements: the quality of the knowledge management infrastructure within the organization and the quality of the knowledge management process.

The quality of the knowledge infrastructure is determined by three main factors:
-   the technology used and its reliance on technology, which enables the required accuracy and speed in performing various knowledge processes;
-   the structure, which governs the relationships between all organizational levels within the organization and must provide the mechanisms and channels that facilitate communication between different parties, thus helping to ensure the smooth transfer of knowledge to and from various entities;
-   and the culture, which represents the social aspect of the knowledge infrastructure and is the most important aspect upon which the creation, use, and sharing of knowledge depend. Without a culture of collaboration and sharing within the organization, knowledge transfer and generation become impossible, even with the highest levels of technology. Therefore, establishing this culture is crucial more than necessary, achieving this depends on the skill and competence of the leaders and managers who bear the responsibility of establishing a culture of cooperation and participation within the organization.

As for the quality of the knowledge management process, it means achieving integration between the various knowledge processes, which the model identified as four processes: acquisition, change, application, prevention, and knowledge security.

D- **The Knowledge Management Process Model by Botha et al (2008)**

This model attempts to offer a more realistic overview of the KM process. The three broad categories overlap and interact with one another. Like Gamble & Blackwell, the focus is on managerial initiatives. Here too the strategic focus (the "when" and the "why" as opposed to the "what") is omitted. It is noteworthy that this model does include the creation of new knowledge as a specific KM initiative.

The model further shows which of the three categories are more people oriented and which are more technology focused. Whether or not knowledge sharing should be largely technology focused is certainly debatable and it is something that I will address in future sections. However, for better or for worse, this is largely how organizations tend to approach the issue i.e. as a technological rather than organizational and social challenge.
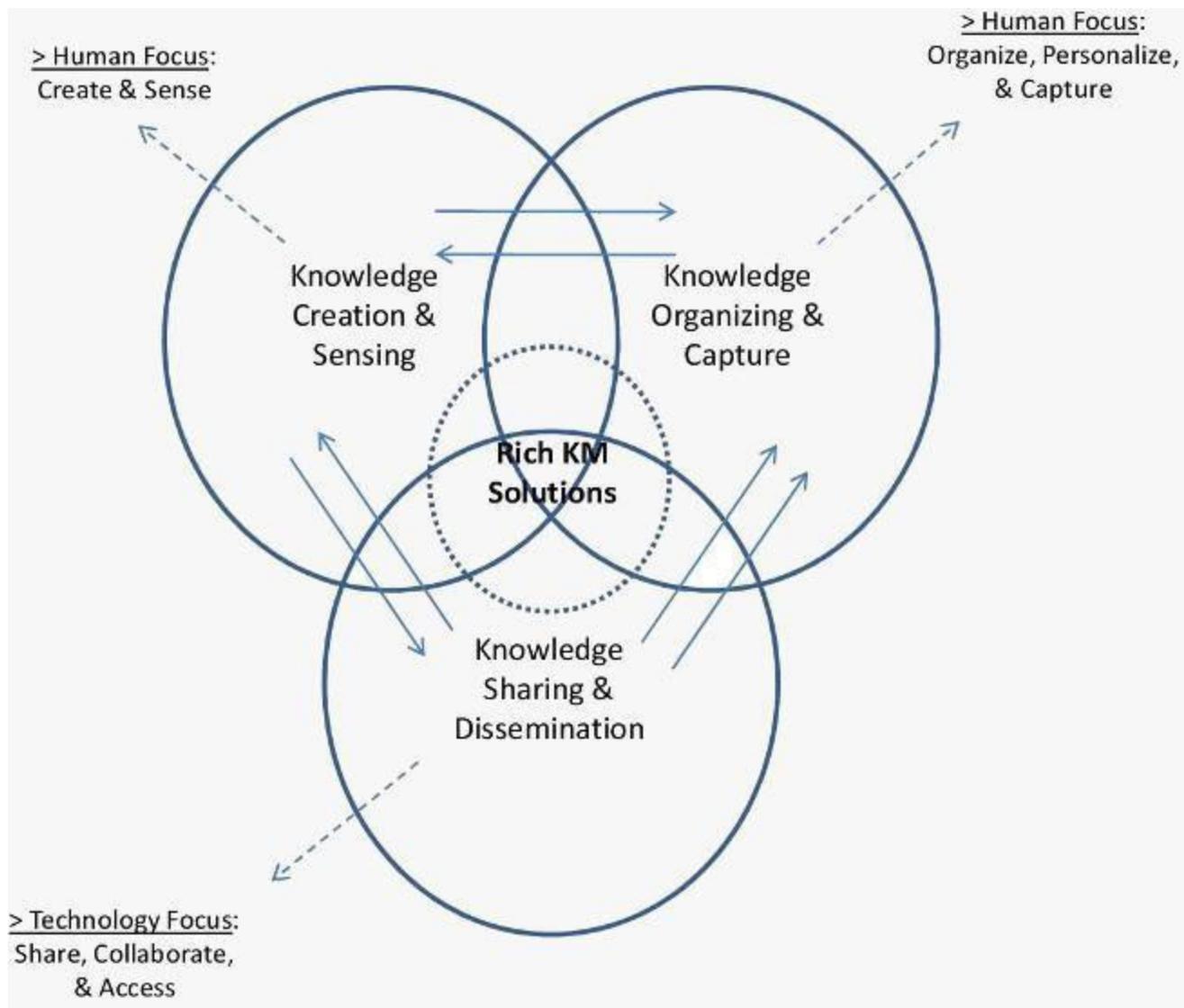
The stages of implementing knowledge management and methods of measuring it

A- Knowledge Management Implementation Stages

Following the knowledge management implementation stages and adhering to their sequence can significantly contribute to the successful implementation of knowledge management within an organization. The knowledge management implementation stages can be divided into:

1- **Initiative Stage:** This stage includes:
- Building the infrastructure;
- Building human relationships;
- Reward systems;
- Managing organizational culture;
- Communication technology.

2. Deployment Stage: This stage focuses on:
- Justifying ideas;
- Establishing justification procedures and policies;
- Using information technology to process and analyze ideas for justification;
- Monitoring knowledge and arbitration tools;
- Acquiring justified and arbitrated knowledge.

3. Internal Integration Stage: This stage focuses on:
- Integrating and funding knowledge according to market requirements.
- Knowledge structuring and mapping;
- Using search engines and their strategies;
- Adopting technology in performance measurement systems;
- Acquiring funded and integrated knowledge

4- External Integration Phase: This phase focuses on:
- Knowledge management efficiency;
- Interconnected networks and external funding;
- Collaboration management;
- Remote and videoconferences;
- Email;
- Knowledge-sharing systems;
- Standardization topics;

- Acquiring foundational and network knowledge.

B- Measuring Knowledge Management:

We are moving towards a knowledge-based economy. Therefore, using appropriate measurement and accounting for the assets that create wealth in a knowledge-based economy is crucial and necessary, by establishing new metrics for a new era (the knowledge age).

1- **Definition of Measuring Knowledge Management:** The concept of measuring knowledge management refers to the efforts made by an organization to evaluate the organization and structure of its informational and knowledge resources, which can be called knowledge capital (or intellectual capital) that the organization possesses. Business organizations recognize this nowadays, its success depends largely on its ability to collect, produce, maintain, and disseminate information and knowledge to develop routine processes that support its flow, learning, protection, and sharing.

2- **Assumptions for Measuring the Value of Knowledge:** Measuring the value of knowledge is subject to several basic assumptions, which are: 1- Knowledge reduces the degree of uncertainty for the decision-maker; therefore, they need knowledge to reach the greatest possible confidence in the soundness of their decisions;

- The value of knowledge depends on the availability of a person with sufficient background knowledge about the subject of the decision in order to use that knowledge. A more experienced person needs less knowledge due to their lower degree of uncertainty compared to someone with less experience in that field;

- The value of knowledge is realized in the form of an increase in the expected value of outputs, and this is considered optimal from the decision-maker's perspective.

The decision-maker must compare the value of knowledge (the resulting increase in output value) with the cost of acquiring that knowledge. The value of knowledge should be greater than, or at least equal to, its cost.

3- **Knowledge Management Measurement Indicators**: The Organisation for Economic Co-operation and Development (OECD) has provided a set of indicators to measure knowledge performance, including:

3-1- **Knowledge Stock and Flow Index:** Peter Drucker argues that tacit knowledge, residing in individuals' minds, cannot be stored. Measuring this knowledge is very difficult because it includes intangible elements. To estimate the knowledge stock, a set of indicators is used, including: patents, and employees in the field of research and development, and the extention of their development is measured, and the knowledge stock of research and development workers (knowledge workers) is assessed through their productivity throughout their working lives. Some believe it is necessary to convert individuals into monetary values and include them in the final budget.

3-2- **Knowledge Production Index:** This index is based on the premise that economic sectors characterized by high knowledge intensity play a fundamental role in long-term performance. The OECD has classified manufacturing economic sectors according to their degree of technological intensity into three categories: high, medium, and low technological. Knowledge intensity can also be estimated through a set of indicators, the most important of which are:
- The value added coefficient of human capital = Revenues (value added) / Human capital (wages).
- The amount of value added resulting from a monetary unit invested by employees = Market value of the organization / (Book value of its assets + depreciation). The higher it is above one, the more the market gives value to the organization. Increase in the assets of the company in question.

In addition to other indicators such as:

• Research and development spending as a percentage of revenue.
• Percentage of sales generated from new products and patents.
• Percentage of knowledge workers.

3-3- **Knowledge Networks Index:** The National Innovation System is considered a knowledge repository consisting of maps of innovation systems and knowledge dissemination. It relies primarily on investigations into innovation, which help capture information about the factors influencing organizations' inclinations and direction towards innovation. The extent to which organizations contribute to disseminating their innovations in the national economy feeds the National Innovation System. This national system also plays an important role in disseminating knowledge among various actors in the national economy, such as universities, research centers, and economic institutions, which take several forms, such as research project funding, cooperation agreements,

patent applications, authorship and licensing, and how to access and obtain university research results, etc.

These are then utilized according to systematic and organized legal frameworks.

3-4- **Knowledge Acquisition Measurement Index:** The effectiveness of the knowledge economy is achieved through the education and training systems, or what is known as the economics of education. Economists used to rely on approximate values to measure it, such as years of experience and educational level, to measure human capital. This index, in reality, does not emphasize quality in either education or training.

Cognitive performance can be expressed by the following equation:
kp (Cognitive Performance) = (E+S+P+R+T∗K)∗G / IKM
where:

E: Value of individual knowledge;
S: Value of knowledge sharing;
P: Value of products;
R: Value of process (and/or technology);
T: Value of tacit knowledge;
K: Tacit knowledge coefficient, which is positive depending on the nature of the company's business;
G: Generation or acquisition of new knowledge;
IKM: Knowledge management inputs (represented by all structural and financial investments for research and development, knowledge, communications, and information technology systems, etc.)

Knowledge Management Measures:

The biggest challenge knowledge management faced at its inception was the difficulty of measuring it. Some even denied the very concept of knowledge management, arguing that what cannot be measured cannot be managed. The difficulty in measurement stems from the fact that we are dealing with intangible assets, creating a gap between theory and practice in knowledge management. Serious attempts have been made to measure knowledge.

Some have pointed out that when a knowledge management initiative is linked to a specific business objective and aligns with a measurement concept suitable for measuring organizational performance, its impact can then be evaluated. Several ideas have been proposed for developing a knowledge management metric that includes six steps:

- Defining objectives;
- Selecting a measurement method;
- Defining specific performance metrics;
- Structuring the measurement process;
- Establishing time-bound performance levels;
- Reviewing and adjusting.

Among the most important knowledge management measures are:

4-1- Measurement of the level of knowledge management in organizations:

Arthur Andersen, in collaboration with the American Productivity & Quality Centre, developed a tool to test an organization's knowledge management capabilities, called the Knowledge Management Assessment Tool. This tool consists of a series of questions:

Q1: Does the organization regularly enhance its knowledge base to gain a competitive advantage?

Q2: Are users and resources available to support and follow up on new ideas, even if the idea fails entirely?

Q3: Do all users contribute to the knowledge base?

Q4: Is information such as sales data, customer profiles, and customer insights organized within knowledge systems?

Q5: Is the work system flexible and adaptive, evolving based on how users access and use information?

Q6: Does your organization consistently measure and track the value of its knowledge capital?

Q7: Does the organization connect with a wide range of sources for best practices?

Q8: Does your organization consistently define the internal knowledge of individual users?

Q9: Are promotions and bonuses... Are other forms of recognition and appreciation designed to encourage knowledge sharing?

Q10: Does the organization rearrange its physical environment to facilitate knowledge sharing?

The answer to these questions is one of the five options listed next to each one, and each option is assigned a score, as follows:

(Never) 0, (Rarely) 1, (Sometimes) 2, (Most of the time) 3, (All the time) 4. Based on the total score, each organization is ranked among the following four levels of knowledge management:

(1-9) points: The organization needs significant improvement.

(10-19) points: The organization is on the right track.

(20-30) points: The organization is ahead of the curve.

31-40 (points): The organization is a leader in the field of knowledge.

4-2- Measuring the Organization's Readiness to Enter a Knowledge Management Program:

The American Society for Training and Development (ASTD) developed a tool to measure and determine an organization's readiness for knowledge management, in addition to identifying intellectual capital. This tool is called the Info Line, and it consists of a set of questions from which the respondent is asked to choose one of three options, corresponding to a number (1-3). Scores are calculated to determine the organization's level of readiness as follows:

Definitively No: 1, Hesitant: 2, Affirmative: 3.

The questions are:

1- The organization's strategy for the next year and the following three years is clear. I understand the organization's critical goals and priorities.

2- The most important knowledge that the organization needs to acquire or share has been identified and is known throughout the organization. We know that intellectual capital is our competitive advantage.

3- Our use of the Recognizing and retaining our employees is closely linked to our business strategies, customer needs, and the organization's knowledge requirements.

4. The people who are critical to our work have been identified, assessed, and cared for effectively.

5. We have an established communication strategy that aligns with the organization's culture, including various media (email, newsletters, newsletters, the internet, etc.).

6. The organization's culture supports learning and sharing information and ideas, rewards innovators, and encourages learning from mistakes.

7. Human resources and training initiatives support the development of a knowledge management system, and the programs include the following

- Competency assessment;

- Learning activities;

- Career development;

- Succession planning;

- Behavioral-based interviewing;

- Performance management system.

8. The organization's training delivers the right training to the right people when they need it, utilizing various media to deliver training (the internet, video, documentation, classrooms, etc.).

9. We have competed with other companies and know the best solutions for knowledge management within the organization.

10. The organization's leaders support the development team and believe in investing in future learning development. Scores are calculated to determine the organization's readiness for knowledge management, falling within the following three levels:

- An organization scoring 25-30 points is well-prepared and positioned for the resulting knowledge management initiative.

- An organization scoring 20-24 points is close and on track, but needs to address some organizational issues to ensure successful implementation.

- An organization scoring 10-19 points should pause; it is not yet ready and should review its knowledge management ideas.