Chapter 2

Review of Literature
CHAPTER 2

REVIEW OF LITERATURE

2.1 Types of Knowledge

For the field of knowledge management, it is quite essential to understand the very difference between the different types of knowledge in reference to the subject. Knowledge once captured needs to be managed in the form of storage and further retrieval for dissemination.

Knowledge as described by experts is of three types:

A. Explicit knowledge: Knowledge expressed as words or numbers. This type of knowledge is codified and well defined. It is the knowledge that can be communicated in formal language. This type of knowledge is the easiest to identify, store, retrieve, modify and thus can be efficiently disseminated also. It is the kind of skills and facts which are articulated in formal language, stored in computer databases/document files, memos, notes, etc. Explicit knowledge is the propriety of the organization.

B. Tacit knowledge: Knowledge expressed as insights, intuitions and hunches. This type of knowledge is highly personal and hard to formalize. It is very personal because it depends on an individual’s actions, commitment and involvement and it is hard to formally communicate. Tacit knowledge is embedded in the brains of individuals. The basis of this knowledge is one’s personal beliefs, values and perspectives. This invisible knowledge incorporates organizational culture, work experience, organizational relationships, etc.

C. Self-transcending knowledge: The ability to sense the presence of potential, to see what does not yet exist. It can also be described as tacit
knowledge prior to its embodiment. It is the most difficult type of knowledge to disseminate and transfer from one part of organization to another. The concept of self-transcending knowledge proposes a distinction between two types of tacit knowledge: tacit-embodied knowledge on the one hand and not-yet-embodied knowledge on the other hand. The distinction is relevant because each of the three forms of knowledge – explicit, tacit-embodied, and self-transcending – is based on different epistemological assumptions and requires a different type of knowledge infrastructure.

The first two are commonly acknowledged as described by Polanyi, M. (1966), while the third was presented by Scharmer, C.O. (2001).

These three types of knowledge can further be classified according to whether the explicit, tacit or self-transcending knowledge can be described as stated by Pierce, E., et al. (2006):

A. **Declarative knowledge**: Facts, know-what comprehension. Uluoglu, B. (2006), explains that declarative knowledge is defined as the factual information stored in memory and known to be static in nature. Other names, e.g. descriptive knowledge, propositional knowledge, etc. are also given. It is the part of knowledge which describes how things are. Things/events/processes, their attributes, and the relations between these things/events/processes and their attributes define the domain of declarative knowledge.

B. **Explanatory knowledge**: Rationalization, know-why knowledge. This type of knowledge provides the scientific understanding of the subject.

C. **Procedural knowledge**: Instructions, know-how understanding. According to Uluoglu, B. (2006), procedural knowledge is the knowledge of how to perform, or how to operate. Names such as know-how are also
given. It is said that one becomes more skilled in problem solving when he relies more on procedural knowledge than declarative knowledge.

D. **General/Organizational knowledge:** Knowledge that is easily transferred and possessed by large numbers of people. As per Hatch, J. (2010), when group knowledge from several subunits or groups is combined and used to create new knowledge, the resulting tacit and explicit knowledge can be called organizational knowledge.

E. **Specific/Individual knowledge:** Knowledge that is difficult to transfer and thus is possessed by very few people.

Lundvall, B.A. (1996), has identified four categories of knowledge:

A. **Know-what:** knowledge about facts that can be broken down into bits and easily codified;

B. **Know-why:** knowledge about principles and laws;

C. **Know-how:** skills, the capability to undertake a given task successfully;

D. **Know-who:** information about who knows what and who knows how to do what.

Collins, H. (1993), classified knowledge as per follows:

A. **Symbolic-type knowledge:** knowledge that can be transferred without loss in codified form, e.g. in books.

B. **Embodied knowledge:** knowledge held within the body of a human, for example how to play golf; the knowledge is internalized, but not easily communicated.

C. **Embrained knowledge:** knowledge held within the physical matter of the brain; certain cognitive abilities are related to the physical structure of the brain.
D. **Encultured knowledge:** that is linked to social groups and society.

Millar, J., et al. (1997), proposed the following classification for knowledge:

A. **Catalogue knowledge:** that is know-what;

B. **Explanatory knowledge:** that is know-why;

C. **Process knowledge:** that is know-how;

D. **Social knowledge:** that is know-who;

E. **Experiential knowledge:** this category presents the new concept of ‘what was’.

Blackler, F. (1995), has put forward the following classification:

A. **Embrained knowledge:** abstract knowledge dependent on conceptual skills and cognitive skills; generally conflated with scientific knowledge and accorded superior status.

B. **Embodied knowledge:** action-oriented and likely to be only partly explicit; transmission requires face to face contact, sentient and sensory information and physical cues; acquired by doing and context-dependent.

C. **Encultured knowledge:** related to the process of achieving shared understanding; embedded in cultural systems, likely to depend strongly on language, and hence to be clearly socially constructed and open to negotiations.

D. **Embedded knowledge:** knowledge that resides in systemic routines; relies on the interplay of relationships and material resources; may be embedded in technology, practices, or explicit routines and procedures.
E. **Encoded knowledge:** knowledge recorded in signs and symbols, such as books, manuals, codes of practice, and electronic records; encoding requires the distillation of abstract codified knowledge from other richer forms of knowledge.

Fleck, J. (1997), has proposed a classification developed on the basis of categorization scheme that also attempts to encompass knowledge source and storage, as well as how it might be acquired and how the different knowledge components might be linked to each other:

A. **Formal knowledge:** embodied in codified theories, formulae; usually encoded in written or diagrammatic form; acquired through formal learning.

B. **Instrumentalities:** embodied in tool and instrument use; requires other components—informal, tacit and contingent for effective use; learnt through demonstration and practice.

C. **Informal knowledge:** embodied in verbal interaction, rules of thumb, and tricks of the trade; held in verbal and sometimes written form (manuals, guidebooks); learnt interaction within a specific milieu.

D. **Contingent knowledge:** embodied in the specific context; distributed, apparently trivial information, specific to a particular context; sometimes available as data which can be looked up; acquired by on-the-spot learning.

E. **Tacit knowledge:** embodied in people; rooted in practice and experience, transmitted by apprenticeship and training.

F. **Meta-knowledge:** embodied in the organization; general cultural and philosophical assumptions; can be local or cosmopolitan; acquired through socialization.

Knowledge taxonomies proposed by Alavi, M., et al. (2001), are shown in Figure 2.1:
<table>
<thead>
<tr>
<th>Knowledge Types</th>
<th>Definitions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tact</td>
<td>Knowledge is rooted in actions, experience, and involvement in specific context</td>
<td>Best means of dealing with specific customer</td>
</tr>
<tr>
<td>Cognitive tacit:</td>
<td>Mental models</td>
<td>Individual's belief on cause-effect relationships</td>
</tr>
<tr>
<td>Technical tacit:</td>
<td>Know-how applicable to specific work</td>
<td>Surgery skills</td>
</tr>
<tr>
<td>Explicit</td>
<td>Articulated, generalized knowledge</td>
<td>Knowledge of major customers in a region</td>
</tr>
<tr>
<td>Individual</td>
<td>Created by and inherent in the individual</td>
<td>Insights gained from completed project</td>
</tr>
<tr>
<td>Social</td>
<td>Created by and inherent in collective actions of a group</td>
<td>Norms for inter-group communication</td>
</tr>
<tr>
<td>Declarative</td>
<td>Know-about</td>
<td>What drug is appropriate for an illness</td>
</tr>
<tr>
<td>Procedural</td>
<td>Know-how</td>
<td>How to administer a particular drug</td>
</tr>
<tr>
<td>Causal</td>
<td>Know-why</td>
<td>Understanding why the drug works</td>
</tr>
<tr>
<td>Conditional</td>
<td>Know-when</td>
<td>Understanding when to prescribe the drug</td>
</tr>
<tr>
<td>Relational</td>
<td>Know-with</td>
<td>Understanding how the drug interacts with other drugs</td>
</tr>
<tr>
<td>Pragmatic</td>
<td>Useful knowledge for an organization</td>
<td>Best practices, business frameworks, project experiences, engineering drawings, market reports</td>
</tr>
</tbody>
</table>

**Figure 2.1: Knowledge Taxonomies**

*Source: adapted from Alavi, M., et al. (2001)*
# 2.2 Definitions of Knowledge Management

<table>
<thead>
<tr>
<th>Author with Year</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Quintas, P., et al. (1997)</td>
<td>Knowledge Management is to discover, develop, utilize, deliver, and absorb knowledge inside and outside the organization through an appropriate management process to meet current and future needs.</td>
</tr>
<tr>
<td>O’Dell, C. and Grayson, C.J., Jr. (1998)</td>
<td>Conscious strategy of putting both tacit and explicit knowledge into action by creating context, infrastructure, and learning cycles that enable people to find and use the collective knowledge of the enterprise.</td>
</tr>
<tr>
<td>Brooking A. (1999)</td>
<td>Knowledge management is the process by which we manage human centred assets. The function of knowledge management is to guard and grow knowledge owned by individuals, and where possible, transfer the asset into a form where it can be more readily shared by other employees in the company.</td>
</tr>
<tr>
<td>Gupta, B., et al.</td>
<td>Knowledge Management is a process that helps organizations find, select, organize,</td>
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</table>
### DEFINITIONS OF KNOWLEDGE MANAGEMENT

<table>
<thead>
<tr>
<th>Author with Year</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>(2000)</strong></td>
<td>disseminate, and transfer important information and expertise necessary for activities.</td>
</tr>
<tr>
<td>Bhatt, G. (2001)</td>
<td>Knowledge Management is a process of knowledge creation, validation, presentation, distribution and application.</td>
</tr>
<tr>
<td>Holm, J. (2001)</td>
<td>Knowledge Management is getting the right information to the right people at the right time, helping people create knowledge and sharing and acting on information.</td>
</tr>
<tr>
<td>Horwitch, M. and Armacost, R. (2002)</td>
<td>Knowledge Management is the creation, extraction, transformation and storage of the correct knowledge and information in order to design better policy, modify action and deliver results.</td>
</tr>
<tr>
<td>Jennex, M.E.</td>
<td>The practice of selectively applying knowledge from previous experiences of decision making</td>
</tr>
<tr>
<td>Author with Year</td>
<td>Definition</td>
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<tr>
<td>Malhotra, Y. (2005)</td>
<td>Knowledge Management refers to the critical issues of organizational adaptation, survival and competence against discontinuous environmental change. Essentially it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings.</td>
</tr>
<tr>
<td>Vivian, K. (2006)</td>
<td>A process that uses a variety of social tools and technologies to capture information that an individual has absorbed and modified, using their own personal experiences and personal understandings as a filter, into a modified iteration of information that can be reviewed and used by others.</td>
</tr>
<tr>
<td>ASTD Learning System (2006)</td>
<td>The explicit and systematic management of intellectual capital and organizational knowledge as well as the associated processes of creating, gathering, organizing, retrieving, leveraging, and using intellectual capital for the purposes of improving organizations and the</td>
</tr>
<tr>
<td>Author with Year</td>
<td>Definition</td>
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<tr>
<td><strong>Bain &amp; Company</strong> <em>(2007)</em></td>
<td>Knowledge Management develops systems and processes to acquire and share intellectual assets. It increases the generation of useful, actionable and meaningful information and seeks to increase both individual and team learning. In addition, it can maximize the value of an organization’s intellectual base across diverse functions and disparate locations. Knowledge Management maintains that successful businesses are a collection not of products but of distinctive knowledge bases. This intellectual capital is the key that will give the company a competitive advantage with its targeted customers. Knowledge Management seeks to accumulate intellectual capital that will create unique core competencies and lead to superior results.</td>
</tr>
<tr>
<td><strong>Pollard, D.</strong> <em>(2007)</em></td>
<td>Knowledge Management is simply the art enabling trusted, context-rich conversations among the appropriate members of communities about things these communities are passionate about. Knowledge Management refers to the management of the components and enabling of</td>
</tr>
</tbody>
</table>
DEFINITIONS OF KNOWLEDGE MANAGEMENT

<table>
<thead>
<tr>
<th>Author with Year</th>
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</thead>
<tbody>
<tr>
<td>Bordeaux, J. (2008)</td>
<td>relationships from which knowledge emerges: used to enhance decision making, spark innovation, and comprehend weak signals in the information environment. Knowledge management does not focus on managing knowledge itself; rather, it seeks the positive interaction of the component elements that can be managed to lay the foundation for better decision making, innovation, and adaptation.</td>
</tr>
</tbody>
</table>

Table 2.1: Definitions of Knowledge Management

2.2.1 The Five-Tier Knowledge Management Hierarchy

To derive a hierarchy suitable for knowledge management research, Hicks, R.C., et al. (2006), have extended the knowledge hierarchy by adding a new personal knowledge class consisting of two tiers – the individual tier and the innovation tier (see Figure 2.2). As individuals create, use, and maintain all of the tiers of the codified knowledge class, the individual tier is positioned as the foundation of the hierarchy. Innovation is considered as the highest level because it integrates all the other tiers, using strategy to exploit both personal and codified knowledge assets. Since there is considerable debate over the definitions of the terms data, information, and knowledge, Hicks, R.C., et al. (2006), have instead used the classifications facts, influences, and solutions, respectively. They have carried this out in order to reach a consensus between the various viewpoints and still arrive at a clearly distinguishable set of definitions for the five-tier knowledge management hierarchy. The definitions suggested for all five tiers are:
• Individual knowledge is defined as “knowledge contained only in the mind of a person”.
• Facts are defined as “atomic attribute values about the domain”.
• Influences are defined as “data in context that has been processed and/or prepared for presentation”.
• Solutions are defined as “clear instructions and authority to perform a task”.
• Innovation is defined as “the exploitation of knowledge-based resources”.

Figure 2.2: The Five-Tier Knowledge Management Hierarchy

Source: adapted from Hicks, R.C., et al. (2006)
2.3 Generations of Knowledge Management

Knowledge has been always around, but as a concept it is extremely broad, with assorted areas of practice. It has been perceived and explained in different disciplines, in respect to that particular discipline, by various philosophers and scientists. Despite much work in the area, the term ‘Knowledge’ and ‘Knowledge Management’, that we use today, are still an open field of research.

According to Grant K.A., et al. (2008), seven key groupings can be seen. The discussions on knowledge start with the work of Plato and Aristotle. Plato (369 BC), in the Theaetetus, tries to answer the question "What is knowledge?" He proposes three key concepts: "Knowledge is perception"; "Knowledge is true belief"; and "Knowledge is true belief with an account". Although some re-visitation of the ideas of Plato and Aristotle was evident in the Scholasticism of the later Middle Ages, it was not until the beginning of the 17th Century that the next wave of thinking about knowledge emerged.

By the early twentieth century, epistemologists' arguments had developed with the recognition, that it was much more difficult to be certain about anything, exemplified by Wittgenstein's thought evolution on the role of language. This debate happened largely in the universities and in the laboratories.

The concept of Information Theory was laid by Shannon in the late twentieth century. The term Knowledge Worker was first used by Drucker and the term Intellectual Asset/Capital was coined by Stewart and Svieby. The term knowledge management came into existence in the mid 1990s.

According to von Krogh, G. (1999), the first generation laid emphasis on locating and capturing of knowledge. New scientific trends and developments for the business systems formed the base of this stage of
knowledge management. The emphasis of second generation was more on the sharing and transfer based methodologies for the locally captured knowledge of the organization. The third generation of knowledge management is aiming at the generation of new knowledge, from the already captured/available knowledge.

In the view of Snowden, D. (2002), the first generation, i.e. considered to be prior to 1995, focused on the appropriate structuring and flow of information to decision-makers, as well as on the computerisation of major business applications. The second generation focused on the movement of knowledge between tacit and explicit states through the four processes of socialisation, externalisation, combination, and internalisation as put forward in form of the SECI model, proposed by Nonaka and Takeuchi in 1995. The third or the present generation is era of reinvention or regeneration of knowledge in new forms. Complex adaptive systems theory is used to create a sense-making model that utilises the self-organising capabilities of informal communities, and identifies a natural-flow model of knowledge creation, disruption and utilisation.

Ahonen, H., et al. (2000), state that first-generation practices included standard implementations of KM, such as various techniques of knowledge and competence mapping and the creation of large company-wide databases or knowledge repositories. The second KM generation focused more on networking, communication and collective practices rather than the things people apparently know and the information they possess. The key idea behind the second generation theories is that knowledge is embedded in and becomes constructed in collective practices. The emphasis here is on sharing with effective communication, and thus preparing for future challenges. The third generation in the view of Ahonen is focused on embedded knowledge, which once properly used in structured form can form the base of innovations and enhance creativity.
2.4 Knowledge Processes – An Overview

Knowledge processes form the core of knowledge management. Knowledge processes are associated with a wide variety of ways to acquire knowledge. Any kind of action (like experiencing, conceptualizing, analyzing, applying, etc.) carried out by the enterprise as a whole or by the individual people of the enterprise; in order to gain knowledge is termed as knowledge process. With the increase in technology and advent of virtual setups, organizations are being forced to adopt a systematic approach for the management of the organizational knowledge. In literature, various knowledge processes have been discussed regarding ways for systematic knowledge management.
In the view of Nonaka, I., et al. (1995), knowledge processes are based on a basic framework that contains two dimensions: ontological and epistemological. The ontological dimension relates to the interaction between tacit and explicit knowledge whereas the epistemological dimension views individuals as the key source of knowledge creation. These two dimensions constitute the four key processes:

- **Socialization:** the process of transferring tacit knowledge from one person to tacit knowledge in another person.
- **Externalization:** the process of making tacit knowledge explicit among individuals within a group.
- **Combination:** the process of knowledge transferring once converted in explicit form.
- **Internalization:** the process of understanding and absorbing explicit knowledge into tacit knowledge held by the individual.

Tannenbaum, S.I., et al. (2000), do not define the different stages of an organizational knowledge creation process, but assert that there are four major processes that collectively determine knowledge management effectiveness. These processes are:

- **Knowledge Sharing:** the extent to which people share their knowledge.
- **Knowledge Accessibility:** the extent to which people have access to the information they need to make decisions, solve problems, perform job tasks and service customers.
- **Knowledge Assimilation:** the extent to which people learn or assimilate the knowledge they need to perform well;
- **Knowledge Application:** the extent to which people apply or use knowledge to effectively make decisions, solve problems and service customers.
Rastogi, P.N. (2000), affirms that for meeting the knowledge management requirements, organizations must plan and implement following process:

- **Identification** of the knowledge required for a competitively effective implementation of enterprise strategy.
- **Mapping** the existing and available knowledge including expertise and skills.
- **Capturing** the existing knowledge through its formalized representation.
- **Acquiring** needed knowledge and information including know-how.
- **Storing** the existing, acquired, and created knowledge in properly indexed and interlinked knowledge repositories.
- **Sharing** knowledge through its automatic access and distribution to users on the basis of their needs and interests.
- **Applying** in support of decisions, actions, problems-solving, providing job aids and training.
- **Creating, generating** or **discovering** new knowledge through research & development, experimentation, lessons learned, creative thinking and innovation.

For competitive advantages, the above discussed processes are considered to be the foundation stones.

Probst, G. (2002), sees knowledge management as a dynamic cycle that is in permanent evolution. He has proposed eight knowledge processes that form two cycles, one inner cycle and other outer cycle. The inner cycle is composed of:

- **Identification** is the process where external knowledge for analyzing and describing the organization’s knowledge environment is identified.
• **Acquisition** refers to what forms of expertise should the organization acquire from outside through relationship with customers, suppliers, competitors and partners in co-operative ventures.

• **Development** is a building block which complements knowledge acquisition. Its focus is on generating new skills, new products, better ideas and more efficient processes. Knowledge development includes all management efforts consciously aimed at producing capabilities.

• **Distribution** is the process of sharing and spreading knowledge which is already present within the organization.

• **Utilization** consists of carrying out activities to make sure that the knowledge available in the organization is applied productively for the benefits.

• **Preservation** process takes place where the selective retention of information, documents and experienced required by management.

There are two other processes in the outer cycle:

• **Knowledge Goals** determine which capabilities should be built on which level.

• **Knowledge Assessment** completes the cycle, providing the essential data for strategic control of knowledge management.

Heisig, P., et al. (2001) advocate four processes which have similarities with the components of the inner cycle of Probst’s model. Their model includes:

• **Create** - refers to the ability to learn and communicate existing knowledge and experience. It is considered to be of critical importance to share information, to create connections between ideas, and to build cross-connections with other topics.

• **Store** - it requires a structured storage capability, which reflects in a quick search for information, access to information for other
employees, and the effective sharing of knowledge as it is easily stored for everyone’s use.

- **Distribute** - this process concedes importance to the development of a team spirit that supports the sharing of knowledge, as colleagues feel connected to each other because they follow common goals and they are dependent on each other in their activities.

- **Apply** - this process starts from the idea that it is possible to create yet more knowledge with the concrete application of new knowledge. This element closes the circle of the core process of unified knowledge management.

McElroy, M. (2002), assumes that knowledge exits only after it has been created. Thereafter it can be captured, codified and shared. McElroy’s model divides the knowledge management process in two key processes:

- **Knowledge Production** is the process in which new organizational knowledge is created. This is formed by Individual Group Learning, Knowledge Claim, Information Acquisition, Codified Knowledge Claim, and Knowledge Claim Evaluation. This process is synonymous with “*organizational learning*”.

- **Knowledge Integration** is formed by some activities that allow knowledge sharing and distribution. It includes knowledge Broadcasting, Searching, Teaching, Sharing and other social activities that communicate.

This model, introduces two new concepts, Supply Side and Demand Side.

- **Supply-side** is the knowledge management practice designed to enhance the supply of existing knowledge to or from workers in an organization.

- **Demand-side** focuses on the supply of existing knowledge to a workforce. It seeks to enhance their capacity to produce. The mission
of demand-side knowledge management, then, is to enhance an organization’s capacity to satisfy its demand for new knowledge.

Knowledge Management Process, as depicted by Collison, C., et al. (2004), is shown in Figure 2.3:

![Figure 2.4: The Knowledge Management Process](image)

*Source: adapted from Collison, C., et al. (2004)*

2.5 **Key Knowledge Management Processes**

Different knowledge management processes have been put forward based on different thoughts. A few knowledge management processes are termed as the key processes, as discussed follows:

2.5.1 **Knowledge Discovery and Detection**

Before knowledge is shared or reused, it must be discovered or detected.
Discovering Explicit Knowledge: This process explores or discovers knowledge through data and knowledge repositories like records, documents, memos and other artefacts. Hidden patterns and relationships within data and text can also be discovered by the use of tools and practices like intelligence gathering, data mining in huge data repositories like data warehouses, and web mining, etc.

Discovering Tacit Knowledge: It is comparatively easy to search for explicit knowledge, because at least the source and the maximum available information can be identified. In discovering tacit knowledge, management of an enterprise should have a clear insight (with certainty) about what and how much do their employees know. Observation and awareness play a major role in this type of understanding. For discovering and detecting tacit knowledge, lots of qualitative and quantitative tools/practices are available, such as knowledge surveys, questionnaires, individual interviews, group interviews, focus groups, network analysis based on observations or other methodologies, etc.

Discovering Embedded Knowledge: This refers to an examination and identification (through reverse engineering and modelling tools), of the knowledge trapped inside organizational culture, routines, processes, products etc. which has not already been made explicit.

2.5.2 Knowledge Capturing and Codification

In the view of Pasha, M.A., et al. (2012) capturing of knowledge means obtaining knowledge from various sources, available in different forms. Knowledge capturing focuses on acquiring knowledge whereas codification focuses on organizing knowledge into explicit form which can be used for specific purposes (Holsapple, C., et al. 1999; Al-Hawamdeh, S. 2002; Dalkir, K. 2005). Balasubramanian, P., et al. (1999) consider knowledge capturing as
a process of collecting and interpreting information from both internal and external sources, and organized into explicit forms for utilization.

In literature many knowledge capturing techniques have been discussed including on-site observation, brainstorming, think-aloud, consensus decision making, repertory grid, nominal group technique, delphi method, concept mapping, blackboard training, apprenticeships, lesson-learned programs, environmental scanning and licensing (Wiig, E.H., et al. 1999).

Knowledge capturing approaches can be divided into three broader groups:

- **Practical approach** advocates that knowledge capturing occurs through work processes, licensing (Wiig, E.H., et al. 1999) and acquiring experts who possess particular knowledge (Gupta, J.D., et al., 2004).


- **Social approach** mainly focuses discussion, interaction of individuals and networking. Social connections and social relations provide information channels that allow members of societies to transfer and capture knowledge (Coleman, J.S. 1988).

Ryu, C., et al. (2005), suggest that an organization can capture knowledge through three methods: learning by doing, learning from others and learning by investment. Learning by doing and learning by investment is educational approach and concerns with education programs. Whereas, learning from others is a social approach and relates to organizational culture and communities of practice. Garza, J.M., et al. (1992) identify three effective methods of capturing knowledge: (i) document review, (ii) observation and iii) expert interviews. Similarly, Hylko, J.M. (2005; 2006) suggests for discussion forums which is again an example of social approach.
2.5.3 Knowledge Organization

This is a process that aids organizations to establish what resources organizations have at their disposal and to specify their strengths and weaknesses in order to organize available knowledge into a manageable format.

According to Pasha, M.A., et al. (2012), knowledge organization is usually considered as an expensive endeavour, particularly since the return on investment is indirect. In other words, there is little visible gain from meticulously classifying and organizing knowledge assets. However, it is an important step in the knowledge management and reuse process.

Knowledge organization involves activities that classify, map, index, and categorize knowledge for navigation, storage, and retrieval (Botha, A., et al., 2008). Markus, M.L. (2001) assigns the role of preparing, sanitizing, and organizing this knowledge to a "knowledge intermediary".

- **Explicit knowledge organization:** In today’s scenario, information technology based tools and techniques play a major role for organizing the documents. IT based systems use taxonomies and ontologies to classify and organize knowledge and information (Bali, R., et al., 2009). Libraries and data marts are also used for managing explicit knowledge (Gamble, P.R., et al. 2001). These categorization methods create a logical, hierarchical knowledge maps, allowing the user to navigate by category. However, Botha, A., et al., (2008) have argued taxonomies are very expensive to create.

- **Tacit knowledge organization:** focus groups, expertise guides, and knowledge coordinators are commonly used for tacit knowledge organization (Gamble, P.R., et al. 2001). However, in organizing tacit knowledge, it is important to take into account in which context the tacit knowledge was created. Expertise locators, such as corporate
yellow pages, and other knowledge maps can be used to pinpoint the location and category of tacit knowledge resources.

- **Embedded knowledge organization:** Gamble, P.R., et al. (2001), argue that job/workplace design, workflow analyses and performance measures can be used to organize embedded knowledge. Knowledge directories or knowledge maps outlining embedded knowledge can be formulated for locating relevant knowledge resources (Horvath, J.A. 2000).

### 2.5.4 Knowledge Sharing

Knowledge sharing is about multiplying the already existing/stored/organized but selective knowledge at the required time and with the required people. Knowledge sharing helps to improve the communication, thus generating ideas for development and innovation. Performance and growth of an enterprise are directly proportional to effectual integration and sharing of the distributed organizational knowledge. The prerequisites for knowledge sharing are:

- association amid the source and the recipient,
- form and location of knowledge,
- recipient’s learning pre-disposition,
- source’s knowledge-spreading capability, and
- the diversified environment in which the sharing occurs.

Pasha, M.A., et al. (2012), suggest that knowledge sharing can be described as either knowledge push or knowledge pull. Knowledge push means when knowledge is "pushed onto" the user (e.g. newsletters, unsolicited publications, etc.) whereas knowledge pull means is when the knowledge worker actively seeks out knowledge sources (e.g. library search, seeking out an expert, collaborating with a co-worker etc.).
As knowledge sharing usually depends on the habit, environment, culture and willingness of the knowledge worker to seek out and/or be receptive to available knowledge sources. So, right culture, incentives, willingness, and so on must be present to make knowledge sharing process productive.

In knowledge sharing process, it is seen that more emphasis is being paid on the management and sharing of the tacit knowledge. In fact, the explicitly available knowledge is much more in abundance and therefore requires skilled measures to be taken for organization and re-organization upon consequent knowledge updations and even the sharing methodology should be revised and reconsidered as per the change and requirement.

2.5.5 Knowledge Transfer

In knowledge management community, the process of dissemination of knowledge among the various components/branches of an organization is termed as knowledge transfer. Argote, L., et al. (2000), define knowledge transfer as "the process through which one unit (e.g., group, department, or division) is affected by the experience of another". They further suggest that the transfer of organizational knowledge (i.e., routine or best practices) can be observed through changes in the knowledge or performance of recipient units. It means knowledge transfer seeks to organize, create, capture or distribute knowledge and ensure its availability for future users. However, the transfer of organizational knowledge, such as best practices, can be quite difficult to achieve.

Jonjoubsong, L. (2008), discusses the two most common approaches adopted for knowledge transfer:

- Technology centered approach,
- Human centered approach.
The technology-centered approach focuses on the use of information technology to transfer explicit knowledge. On the other hand, the human-centered approach is concerned with the techniques to be used for the transfer of tacit knowledge. The technology centered approach mainly focuses on the codification in which knowledge is transferred through a ‘people-to-document’ method. Whereas, the human-centered approach, on the other hand, refers to a personalization approach through which knowledge is transferred through interaction, socialization and learning processes (Carrillo, P., et al., 2006; Hansen, M.T., et al., 1999).

Jonjoubsong, L. (2008), suggests that from the indigenous knowledge perspective, knowledge transfer is focused on the human-centered or personalization approach, because indigenous knowledge is tacit, collective, experiential, subjective and holistic.

Dixon, N.M. (2000), has identified five different types of knowledge transfer situations, called serial transfer, near transfer, far transfer, strategic transfer, and expert transfer. For each of these situations, Dixon offered “design guidelines” for successful knowledge management.

Gupta, A.K., et al. (2000), affirm that an enterprise’s socialization mechanisms can enhance the richness of communication channels, because interpersonal familiarity and relationship can increase the openness of communication. Another important factor directly affecting knowledge transfer process is motivation, which depends on incentive systems. Rewards and incentive systems can trim down the willingness of organizational members to share their knowledge, because intrinsic motivation is derived from enjoyment in doing tasks and self-actualization. Similarly, the value of knowledge also affects knowledge transfer process. The value of knowledge is concerned with perception of the benefit of knowledge gained. The value of knowledge transferred is
considered in terms of the relative advantage and relevance of knowledge needed.

2.5.6 Knowledge Acquisition

The attainment of knowledge or meta knowledge from any one or more of the knowledge resources such as human beings, physical documents/memos/files, computer based files/databases/data marts/data warehouses, or any sensory input, etc. is termed as knowledge acquisition.

In a business environment, the main sources for knowledge acquisition are customers, suppliers, competitors, and partners/alliances. These can be considered external sources of knowledge chain (Gamble, P.R., et al. 2001). Gerbert, H., et al. (2002) has identified three different types of customer knowledge:

- **Knowledge for customer**: The knowledge that the customers can gain in order to satisfy their knowledge needs. It can include product, market, and supplier knowledge. It can be sourced within the organization or from other external sources like other customers and competitors (Zanjani, M.S., et al., 2008).

- **Knowledge about customer**: The kind of knowledge that enables us to know the customer better, to understand their motivations, and to address them better. This includes their requirements, expectations, and purchasing activities.

- **Knowledge from customer**: The kind of knowledge that deals with the feedback from customers regarding products, suppliers, and markets. It can be used to improve organizations’ products and services.
These three categories apply to customer knowledge acquisition as well as to data and information, which can be processed and used to create knowledge (Zanjani, M.S., et al., 2008).

Gerbert, H., et al., (2002), suggest that the following methods could be used to collect customers’ knowledge:

- Collecting customer’s feedback
- Collecting and processing marketing related information
- Collecting customers’ suggestions
- Customers’ involvement in development/design

Chan, J.O. (2009), presents a classification for supplier knowledge based on the concepts outlined by Gerbert, H., et al. (2002). These are:

- **Knowledge for suppliers**: This is the knowledge that suppliers require. It includes "production needs and forecasts, inventory, products, customers, and markets".

- **Knowledge about suppliers**: This is knowledge that is used to understand how the supplier can match the requirements of the organization. It provides insight regarding quality, delivery, defects, financial risks etc.

- **Knowledge from suppliers**: This refers to the knowledge that suppliers have gathered from their dealings with the organization.

In the view of Pasha, M.A., et al. (2012), talking about the role of Competitors’ knowledge, it is important to note that the outcome of a successful knowledge acquisition process also depends on competitors to a reasonably extent; particularly in today’s online business environment where competitors’ products are only three mouse-clicks away. In such a volatile environment, the competitors’ knowledge becomes a fairly
important aspect of knowledge acquisition. In this case knowledge acquisition involves collecting, organizing and presenting the data, information, and knowledge that the organization has acquired from its’ competitors in such a way that one can search, retrieve, and analyze. Some of this falls within the scope of information management, but it is particularly the process of using these components to create better decisions and new knowledge that provide a competitive edge to the organization. IT systems are equally useful in this case as well, since the sources are largely explicit and presumably require frequent updating and manipulation. Data mining and analysis, document management systems with suitable search functions and expert systems are most relevant here.

The knowledge of Partners/alliances is also important for knowledge acquisition. Alliances’ knowledge is a valuable potential resource. However these must be properly managed. Key success factors include fostering trust, learning from the partner, and effectively managing the creation of knowledge relevant to both parties. Knowledge transfer can be facilitated by personnel exchanges, common projects and other forms of regular interaction, technology sharing, etc. (Gamble, P.R., et al. 2001). Focusing on informal communication, collaboration, and socialization is of paramount importance for valuable tacit knowledge acquisition and for extending communities of practice beyond the organization's borders.

Chan, J.O. (2009), formulates a set of knowledge types, based around the work of Gerbert, H., et al. (2002):

- **Knowledge for partners**: Knowledge which satisfies their needs, including "knowledge about products, markets, and suppliers".

- **Knowledge about partners**: Knowledge acquisition focused on understanding the ability of partners to perform their role in the
relationship. It includes distribution channels, products, services, etc.

- **Knowledge from partners:** The knowledge that partners have accumulated from dealing with the organization.

### 2.5.7 Knowledge Verification

All the knowledge collected and stored by an enterprise is not always suitable for usage. It needs to be tested, verified or revised according to the requirement. Bhatt, G. (2000), asserts that knowledge development for organizations encompasses review and revision processes in order to verify knowledge. Knowledge verification is the process of testing and adapting particular knowledge based on the situation in order to be suitable for the organization (Jonjoubsong, L. 2008). This can be viewed as an evaluation process to verify the appropriateness of new knowledge for organizational Collison, C., et al. (2004).

### 2.5.8 Knowledge Utilization

The usage and application of the knowledge for the purpose of enterprise’s efficient functionality and decision making is known as knowledge utilization.

Holsapple, C., et al. (1999), consider knowledge utilization as the process of applying existing knowledge in order to generate new knowledge and produce externalization. This knowledge utilization is concerned with applying knowledge possessed in the organization to perform activities that can be seen to have explicit results, such as products, services, procedures and regulations.

Alavi, M., et al. (2001) and Dalkir, K. (2005) consider knowledge utilization to be the application of knowledge using computer-based tools.
which allow organization members to access knowledge through knowledge management systems. However, knowledge management applications alone cannot ensure that knowledge will be applied to business operations or products and services.

For knowledge utilization, three features are supposed to be important:

- **Technological**,  
- **Operational, and**  
- **Social.**

The combination of operational aspect with the technological feature, plays a pivotal role in facilitating access to knowledge repositories, whereas the combination of operational with the social aspect aids in the attainment of the organization’s business related objectives and goals.

### 2.5.9 Knowledge Creation

According to Nonaka, I. (1994), knowledge creation is about continuous transfer, combination, and conversion of different types of knowledge, while users practice, interact, and learn. Knowledge creation encompasses the processes of individual knowledge enlargement, amplification, crystallization, justification and networking knowledge. Knowledge creation also involves generating and discovering new knowledge of any types, and covers the conversion of tacit knowledge into explicit knowledge and vice versa. Figure 2.4 shows the Nonaka’s knowledge creation modes as depicted below:
In the view of Pasha, M.A. (2012), to encourage knowledge creation process the management needs to consider following aspects:

- **To enable and encourage knowledge sharing:** Management must understand where and in what forms knowledge exists. They must then provide the right forums for knowledge to be shared. For tacit knowledge this implies a particular emphasis on informal communication, while for explicit knowledge this implies a focus on a variety of information technology systems. On the strategic side, management must create/design the right environments, processes, and systems that provide the means and willingness to promote knowledge sharing.
• **To create a suitable work environment:** The workplace itself is a microcosm of activities. People spend most of their time per week at their workplaces and are expected to be happy and productive. Therefore, a suitable work environment is now widely recognized as a mechanism through which greater development outcomes can be achieved. A suitable work environment includes the notion of creating interplay between knowledge and knowing. It implies offering relevant training, but most importantly allowing new knowledge to be created through interaction, practice, and experimentation.

• **To provide systems that supports the work process:** These can be knowledge management systems that facilitate communication, creation, transfer, and application of knowledge. However, knowledge management systems should ensure that adoption and innovation of business performance outcome occurs in alignment with changing dynamics of the business environment.

• **To provide knowledge workers with timely, relevant information and data:** Accurate, relevant, and timely information is a key to good decision making. Technology based systems help to store, retrieve, organize, and present information and data in an efficient way. Such systems also offer following advantages:
  
  - Time sensitive information becomes easily available
  - Decision making is improved
  - Potential market advantage can be maintained
  - Data and toolset can be shared
  - Data security becomes possible
  - Cost reduction
  - Knowledge can be shared at organizational level
Customer services can be improved

2.5.10 Knowledge Reuse

Markus, M.L. (2001), has defined that the knowledge reuse process comprises of four stages:

- Capturing or documenting knowledge,
- Packaging knowledge for reuse,
- Distributing or disseminating knowledge (providing people with access to it), and
- Reusing knowledge.

He explained that capturing and documentation of knowledge can occur in at least four ways:

- Documentation can be a largely passive by-product of the work process, as when virtual teams or communities of practice automatically generate archives of their informal electronic communication that can later be searched.

- Documenting knowledge for potential reuse can occur within a structure such as that provided by facilitators using brainstorming techniques, perhaps mediated by the use of information technology, a knowledge sharing process, appropriate incentives, process facilitation, etc.

- Documenting can involve creating pre-structured records (for example, of technical support interventions) as part of a deliberate, before-the-fact knowledge reuse strategy.

- Documentation can involve a deliberate, after-the-fact strategy of filtering, indexing, packaging, and sanitizing knowledge for later
reuse, as in the creation of learning histories, consultants’ “Power Packs”, expert help files, or the creation of a data warehouse.

According to him, packaging knowledge is the process of culling, cleaning and polishing, structuring, formatting, and/or indexing documents against a classification scheme. Among the activities involved in knowledge packaging are:

- authoring knowledge content,
- codifying knowledge into “knowledge objects” by adding context,
- developing local knowledge into “boundary objects” by deleting context,
- filtering and pruning content, and
- developing classification schemes.

The knowledge reuse phase may consist of four different activities:

- Defining the search question. This step is essential for successful reuse.
- Search for, and location of, experts or expertise.
- Selection of an appropriate expert or of expert advice from the results of the search.
- Applying the knowledge, which may involve analysis of general principles against a specific situation—a process sometimes called “re-contextualization” of knowledge that was de-contextualized when it was captured and codified.
Markus has identified three roles which directly influence knowledge reuse process:

- **Knowledge producer**: The original creator of the knowledge

- **Knowledge intermediary**: The one who packages and prepares the knowledge so that it may be stored, retrieved, and shared. This may involve any number of functions such as indexing, categorization, standardizing, publishing, mapping, etc.

- **Knowledge consumer**: The person who is the recipient and user of the knowledge in question.

These three functions may involve different people or they may all be done by the same person.

### 2.6 Knowledge Management Models

Numerous models or frameworks have been proposed for knowledge management. These could be broadly classified into two types: Sequential or Over-lapped. As knowledge management is closely related to different disciplines like strategic management, information management, etc., the overlapping situation poses complexities.

Knowledge management is not considered as a discipline by many. There are no standardized guidelines proposed by as such, still the literature available so far tries to answer the following queries which formulate the basics of knowledge management framework:

**What** – knowledge management processes which form the core of framework.

**When** – knowledge management is effective when timely applied. Another important factor is the selection of a particular technique at a specific time. The optimized selection closely related to time is the key to success.
How – refers to the organizational processes and the methodologies used for implementation.

Why – This is closely related to the factor “when”. The reasoning behind the choice or selection of methods falls in this category.

Who – This section deals with the means or driving force behind the implementation of a knowledge management activity.

Where – Based on the knowledge management activities, an organization can be categorized into sections. “Where” indicates that particular section which will be affected by the knowledge management activity.

Some famous knowledge management models are discussed as follows:

2.6.1 The SECI / Nonaka-Takeuchi Model

For generation, transferring and re-creation of knowledge Nonaka I., (1991) and Nonaka I., (1995) proposed a model which is considered to be the first model towards a structured approach of knowledge management. This model is also known as the SECI model, based on Socialization, Externalization, Combination and Internalization. This model characterizes the following:

- An interaction dynamic (transfer)
- Two forms of knowledge - tacit and explicit
- Three levels of social aggregation - individual, group, context
- Four knowledge-creation processes - socialization, externalization, combination and internalization

It is explained that the interaction between the tacit and explicit knowledge are accomplished through systems, structures, and organizational culture which assist the four knowledge-creating processes:
• **Socialization** - *tacit to tacit*: the sharing of tacit knowledge between individuals through joint activities.

• **Externalization** - *tacit to explicit*: to convert tacit knowledge into publicly comprehensible forms.

• **Combination** - *explicit to explicit*: the conversion of explicit knowledge into more complex sets of explicit knowledge for communication and dissemination.

• **Internalization** - *explicit to tacit*: the conversion of externalized knowledge into tacit knowledge on an individual or organizational scale. The embodiment of explicit knowledge into actions, practices, processes and strategic initiatives.

![Figure 2.6: The SECI / Nonaka-Takeuchi Model](image-url)
Sven, J., et al., (2003), explain that Nonaka and Takeuchi model describes the conditions which allow the creation of organizational knowledge:

- **Intention**: expressed by the organization will to fulfill its purposes (formulating strategies in business context).

- **Autonomy**: the situation when individuals are acting autonomous, according to some minimum specifications, being implied in teams with self organizing capabilities.

- **Fluctuations and creative chaos**: specific condition which stimulates the interaction between the organization and the external environment.

- **Redundancy**: the existence of information which exceeds the operational requests of organizational members.

- **Variety**: internal diversity which offers every employee rapid access to a variety of information.

The central thought of the model is that sharing of knowledge by one individual with another interconnects to a new knowledge. The more and more, the spiral of knowledge is carried out, the higher and more efficient knowledge is emitted.

Nonaka, Toyama and Konno (2000, 2001) further added the Japanese concept of ‘Ba’ to the SECI model. ‘Ba’ relates to the physical, relational and spiritual elements of ‘place’, or perhaps more expansively ‘context’. Four different notions of “Ba” are defined in relation to each of the four quadrants of the SECI model, which as a group give rise to the ‘knowledge spiral’. These are as follows:
• The Originating “Ba”: a locale where individuals can share feelings, emotions, experiences and perceptual models

• The Dialoguing “Ba”: a space where tacit knowledge is transferred and documented to explicit form. Two key methods factors are through dialogue and metaphor creation.

• The Systematizing “Ba”: a virtual space, where information technology facilitates the recombination of existing explicit knowledge to form new explicit knowledge and;

• The Exercising “Ba”: a space where explicit knowledge is converted into tacit knowledge.

2.6.2 Hedlund and Nonaka’s Knowledge Management Model

The process of knowledge management as presented by Nonaka is correct, but the actual transfer of knowledge is not a very simple, but quite a complex process. This refined version of the previous model was developed to describe the four levels of carriers or agents of knowledge in organizations. This four levels of ‘carriers’ perspective assumes that knowledge is categorized into the individual, the group, the organization and the inter-organizational domains.

Hedlund and Nonaka (1993) argue that knowledge management characteristics can have serious implications for the various types of activities such as innovation and strategies and this can affect organizations’ success or failures. Hence, this suggests that the essence of organizations’ survival and success can depend on how they create, transfer and exploit their knowledge resources.
Individual Group Organization Inter-organizational

<table>
<thead>
<tr>
<th>Articulated knowledge</th>
<th>Knowing calculus</th>
<th>Quality Circle’s documented analysis of its performance</th>
<th>Organization chart</th>
<th>Supplier’s patents and documented practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tacit knowledge</td>
<td>Cross-cultural Negotiation Skills</td>
<td>Team coordination in complex work</td>
<td>Corporate Culture</td>
<td>Customer’s attitudes to products and expectations</td>
</tr>
</tbody>
</table>

Table 2.2: Hedlund and Nonaka’s four levels of ‘carriers’

### 2.6.3 Von Krogh and Roos Model

As per Cristea, D.S., et al. (2009), the Von Krogh and Roos model brings a clear distinction between individual knowledge and social knowledge, following an epistemological point of view regarding knowledge management. According to this model, the following aspects should by analyzed:

- why and how the knowledge gets to the employees of a company
- why and how the knowledge reaches the organization
- what does it mean knowledge for the employee/organization
- what are the barriers for organizational knowledge management

Krogh, V. and Roos, J. (1998), examined the nature of knowledge management from the perspective of: employees, communication, organizational structure, links between members and management of human resources.

These five factors can generate problems which can prevent knowledge management strategies. For example, if the employees do not perceive the
knowledge as being an important part of the company, the effects will be seen in their quality of work. Also, if there is no common language to express new knowledge, keeping this new knowledge will be very difficult. In the case where members of the organization are not willing to share their experiences, it will be extremely difficult to generate social collective knowledge. Companies should use elements which activates knowledge by the stimulation of the employees.

This approach was further refined to identify a model for “knowledge activation”, before starting a knowledge management program. Activation refers to the general set of organizational activities which positively affects knowledge creation. These activities can highly improve human relationships, conversations and sharing local knowledge.

2.6.4 Earl’s KM Model

Earl, M., et al. (1998), proposed a classification, "Trite and imperfect as this classification is, it suggests that knowledge comprises expertise, experience, know-how, skills and competence...". He further recognized two organizational states that are relevant to knowledge management: knowledge and knowing. Earl explained that an organization may usefully concern itself with the creation, protection and leveraging of its knowledge assets by attending to four functions:

1. **Inventorizing:** mapping individual and organizational knowledge,
2. **Auditing:** assessing the nature and extent of planned ignorance and then developing knowledge through learning activities,
3. **Socializing:** creating events which enable people to share tacit knowledge,
4. **Experiencing:** addressing the problem of unknown ignorance by learning from experience, action and handling unusual situations.
2.6.5 Wiig Model

The model’s baseline is that useful and valuable knowledge can only be obtained from an organized format. A human brain, in order to organize knowledge makes use of semantic networks, and Wiig’s model is based on this concept. The first and foremost thing that this model addresses is the relevance of the knowledge in relation to the source from which it originates (the source can be one’s brain or any other explicit repository). Secondly, it tries to set a relationship between the different elements of the knowledge, as very few elements are completely independent. The more cohesive the relationship, the higher is the knowledge content value. As per Cristea, D.S., et al. (2009), as a consequence, all the facts, concepts, perspectives, values, judgments must be consistent. We should try to reach a situation where there are no logical inconsistencies, internal conflicts or misunderstandings. Wiig model defines many levels regarding the internalization of knowledge.

Wiig, K. (2004), explains 5 levels/degrees of internalization which are as follows:

**Level I – Novice** – The person has extremely low consciousness (even not at all) about knowledge and the way it can be used.

**Level II – Beginner** – The person knows about knowledge existence and where it can be obtained, but he doesn’t know the way it can be used.

**Level III – Competent** – The person knows, but the possibility of using knowledge is limited.

**Level IV – Expert** – The person keeps the knowledge in mind, understands where it can be applied, and works with knowledge without external intervention.

**Level V – Master** – Completely internalization of knowledge; a master has a profound understanding about the events in his environment.
Cristea, D.S., et al (2009) identifies three knowledge forms:

a) **Public** (explicit, can be learned and shared),

b) **Sharing expertise** (Intellectual assets which are held exclusively by employees and shared during work or embedded in technologies. This type of knowledge is usually communicated through a specialized language and representations),

c) **Permanent knowledge** (the least accessible, but the most complete form of knowledge. It’s usually tacit and used without knowing).

Wiig model also addresses four types of knowledge: based on facts, conceptual knowledge, methodological knowledge and expectation knowledge. Knowledge based on facts is about data, causal links, measures and readings – having an observable content, directly measurable. Conceptual knowledge implies systems, concepts and perspectives. Methodological knowledge is used by strategies, methods for decision refining and other techniques. Expectation knowledge refers to judgments, hypothesis and expectations of the persons that possess them.

### 2.6.6 Comparative Review of Knowledge Management Frameworks

<table>
<thead>
<tr>
<th>Frameworks</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leonard-Barton, 1995</td>
<td>1. <em>Shared and creative problem solving</em></td>
</tr>
<tr>
<td></td>
<td>2. <em>Importing and absorbing technological knowledge from the outside of firm</em></td>
</tr>
<tr>
<td></td>
<td>3. <em>Experimenting and prototyping</em></td>
</tr>
<tr>
<td></td>
<td>4. <em>Implementing and integrating new methodologies and tools</em></td>
</tr>
</tbody>
</table>
### Frameworks

<table>
<thead>
<tr>
<th>Frameworks</th>
<th>Descriptions</th>
</tr>
</thead>
</table>
| **Arthur Anderson and APQC, 1996** | 1. Share  
2. Create  
3. Identify  
4. Collect  
5. Adapt  
6. Organize  
7. Apply |
| **Wiig, 1993**                  | 1. Creation  
2. Manifestation  
3. Use  
4. Transfer |
| **Choo, 1996**                  | 1. Sense making (includes “information interpretation”)  
2. Knowledge creation (includes “information transformation”)  
3. Decision making (includes “information processing”) |
| **Van der spek and Spijkervet, 1997** | In the Act process  
1. Develop  
2. Distribute  
3. Combine  
4. Hold |
| **Nonaka, 1996**                | 1. Socialization (conversion from tacit knowledge to tacit knowledge)  
2. Internalization (conversion from explicit knowledge to tacit knowledge)  
3. Combination (conversion from explicit knowledge to explicit knowledge)  
4. Externalization (conversion from tacit knowledge to explicit knowledge) |
<p>|                                 | 1. Acquisition (knowledge creation and content) |</p>
<table>
<thead>
<tr>
<th>Frameworks</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alavi, 1997</td>
<td>Development)</td>
</tr>
<tr>
<td></td>
<td>6. Application</td>
</tr>
<tr>
<td>Szulanski, 1996</td>
<td>1. Initiation (recognize knowledge need and satisfy it)</td>
</tr>
<tr>
<td></td>
<td>2. Implementation (knowledge transfer take place)</td>
</tr>
<tr>
<td></td>
<td>3. Ramp-up (use the transferred knowledge)</td>
</tr>
<tr>
<td></td>
<td>4. Integration (internalize the knowledge)</td>
</tr>
</tbody>
</table>

Table 2.3: Comparative Review of Knowledge Management Frameworks


2.7 Definitions of Competence

These definitions can be classified into three categories:

- Performance focused definitions
- Knowledge/skills/attitude focused definitions
- Overall organizational performance oriented definitions

2.7.1 Performance Focused Definitions

<table>
<thead>
<tr>
<th>Author with Year</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>An underlying characteristic of an individual that is casually related to criterion-referenced effecting and/or superior performance in a job situation. Competences can be distinguished</td>
</tr>
<tr>
<td>Author with Year</td>
<td>Definition</td>
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<tr>
<td><strong>Spencer, L.M. and Spencer, S.M. (1993)</strong></td>
<td>into essential, competences which serve as the foundation of knowledge and skills needed by everyone and differentiating competences, which are used to distinguish superior performance from average performance and they may include characteristics such as self-concepts, traits and motives.</td>
</tr>
<tr>
<td><strong>Lachance, J.R. (1999)</strong></td>
<td>An underlying characteristic of an employee (i.e., a motive, trait, skill, aspects of one’s self-image, social role, or a body of knowledge) which results in effective and/or superior performance.</td>
</tr>
<tr>
<td><strong>Sinnott, G.C., Madison, G.H. &amp; Pataki, G.E. (2002)</strong></td>
<td>A characteristic of an employee that contributes to successful job performance and the achievement of organizational results. These include knowledge, skills, and attributes plus other characteristics such as values, motivation, initiative and self-control.</td>
</tr>
<tr>
<td><strong>Missouri Library Association (2005)</strong></td>
<td>An underlining characteristic of an individual that is directly related to effective or superior performance in a job. Differentiating competencies distinguish superior from average performer.</td>
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</table>

Table 2.4: Performance Focused Definitions
### 2.7.2 Knowledge/Skills/Attitude Focused Definitions

<table>
<thead>
<tr>
<th>Author with Year</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>McClelland, D.</td>
<td>The knowledge, skills, traits, attitudes, self-concepts, values, or motives directly related to job performance or important life outcomes and shown to differentiate between superior and average performances.</td>
</tr>
<tr>
<td>(1973)</td>
<td></td>
</tr>
<tr>
<td>United Nations Industrial Development Organization (2002)</td>
<td>A set of skills, related knowledge and attributes that allow an individual to perform a task or an activity within a specific function or job.</td>
</tr>
<tr>
<td>International Board of Standards for Training, Performance and Instruction (2006)</td>
<td>An integrated set of skills, knowledge, and attitudes that enables one to effectively perform the activities of a given occupation or function to the standards expected in employment.</td>
</tr>
</tbody>
</table>

Table 2.5: Knowledge/Skills/Attitude Focused Definitions
### 2.7.3 Overall Organizational Performance Oriented Definitions

<table>
<thead>
<tr>
<th>Author with Year</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Cheetham, G. and Chivers, G. (2005)</td>
<td>Overall, effective performance within an occupation, which may range from the basic level of proficiency to the highest levels of excellence. A competence consists of four main components, namely, knowledge/cognitive competence, functional competence, personal or behavioural competence and value/ethical competence. Knowledge/cognitive competence is defined as “the possession of appropriate work-related knowledge and the ability to put this to effective use”. Functional competence is defined as “the ability to perform a range of work-based tasks effectively to produce specific outcomes”. Personal/behavioural competence is defined as “the ability to adopt appropriate, observable behaviours in work-related situations”. Values/ethical competence is defined as “the possession of appropriate personal and professional values and the ability to make sound judgments based upon these in work-related situations”.</td>
</tr>
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The cognitive (e.g. knowledge and skills),
OVERALL ORGANIZATIONAL PERFORMANCE ORIENTED DEFINITIONS

<table>
<thead>
<tr>
<th>Author with Year</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ley, T. (2006)</td>
<td>affective (e.g. attitudes and values), behavioural and motivational(e.g. motives) characteristics or dispositions of a person which enable him or her to perform well in a specific situation.</td>
</tr>
</tbody>
</table>

Table 2.6: Overall Organizational Performance Oriented Definitions

2.8 Competency: An Overview

According to Tampoe, M. (1994), for organizations, focusing on the continuous development of their employees’ competencies is also necessary, since it gives them the opportunity to stand out to their competitors. As per Bergenhenegouwen, G.J. (1997), and Nyhan, B. (1998), the management literature increasingly acknowledges the importance of competency development in enhancing the competitiveness and performance of an organization. As such, competency development becomes a crucial strategic management tool in today’s work environment.

The question that rises is which competencies employees need to develop to ensure an effective or superior performance in their current and future jobs. Kuipers, M. (2003), discerns three important types of competencies at work. First, functional competencies are defined as the knowledge and skills necessary for employees to successfully perform their jobs. These functional competencies are based upon the employees’ tasks and roles and, hence, differ according to the industry and function. Second, learning competencies are defined as the individual characteristics of an employee that enable him/her to develop new functional competencies.
According to Lindley, R.M. (2002), learning competencies increasingly gain importance in the work environment since the rise of the knowledge economy and the growing need for flexibility make it important for employees to continuously invest in their development. Finally, career competencies are described as the individual characteristics of an employee that enable him/her to guide his/her functional and learning competencies in the right direction.

As discussed by Kuijpers, M. (2003), De Vos, A., et al. (2008), and DeFillippi, R., et al. (1994), thereby, career competencies refer to the employee’s creation of a career identity by gaining insight into his/her own possibilities and motives and the employee’s ability to proactively translate these insights into concrete actions that can direct his/her career. As the new career era holds individuals, primarily responsible for their own career, career competencies become increasingly important today, says Hall, D.T., (1996). Competency and its underlying manifestations are shown in Fig 2.6:
Figure 2.7: Competency and its underlying manifestations

Competency

- Skills Set
- Ability
- Behaviour
- Values
- Performance
- Attitude
- Knowledge
- Initiative
Ogrean, C., et al. (2009) suggest that competencies are always described as observable, measurable behaviours, but they are not simply concrete actions that are easily imitated. Instead, competencies can be manifestations of some underlying intent – driven by a person’s basic motivations, personality, attitude, values, or self-concept. It is an enduring characteristic of a person that predicts behaviour across many workplace situations.

2.9 Competency Development

In this perspective, Heinsman, H., et al. (2006), feel that scholars describe competency development as an important feature of the wider defined concept of competency management. They describe competency management as “an important human resource tool that is often used within organizations to guide human resource practices such as selection, assessment, career management, employee development, and performance appraisal”. Building further on the work, Forrier, A., et al. (2009), define competency development as: “an important feature of competency management which encompasses all activities carried out by the organization and the employee to maintain or enhance the employee’s functional, learning and career competencies”.

Competency development draws its strength from a variety of different learning activities, as per Poel, R.F., et al. (2004). More specifically, training, on-the-job learning and career management are directed at the development of different types of competencies. The development of functional competencies is mainly achieved through training and on-the-job learning. Although learning competencies and career competencies can also be incorporated in formal training sessions, these competencies are mainly established through career management practices and on-the-job learning activities, which put a stronger emphasis on the employee’s responsibility for and active involvement in competency development. This emphasis on self-reflection and self-
management leads to an increase in learning and career competencies, according to Vos, A.D., et al. (2011).

According to Heinsman, H., et al. (2006), competency development forms part of the broader defined concept of competency management.

Within the boundaries of competency management, organizations follow a clear outline in the development of employees’ competencies. First, the functional, learning and career competencies of an employee are assessed as part of the performance management cycle, in the view of Armstrong, M. (1999) and Dewettinck, K. (2008).

Second, the competency assessment carried out within the performance management cycle leads to a personal development plan. This personal development plan forms a guide to competency development by telling employees which competencies they need to develop and how they can develop them in a better way.

According to Vos, A.D., (2011), the process of competency development is a never-ending story in which the assessment of competencies leads, via the creation of a personal development plan, to the development of competencies. As employees continuously meet new challenges in their working life, the need for a new competency assessment will emerge.

Competency development always occurs in a broader organizational context. As such, the initiatives undertaken by an organization in the light of competency development need to fit in this context, meaning that those practices that might be effective in one organization might not be effective in another organization.

Competency development enables vertical alignment by aligning organizational, team and individual goals, in the view of (Cardy, R. L., et al. 2006; and Fleury, M. T. L., et al., 2005). The competency framework
implicates the development of a mutual language throughout the organization, making it possible to translate an organization’s strategy into individual goals and competencies for every employee, as per Audenaert, M., et al. (2009) and Fleury, M. T. L., et al. (2005).

According to Van der Heijde, C. M. (2006), employability is defined as “the continuous fulfilling, acquiring or creating of work through the optimal use of competencies”. As such, having more or better developed competencies implies a higher level of employability. Likewise, Scholarios, D., et al. (2008), argue that a continuous development of competencies is a prerequisite for enhancing employability. Increased employability offers advantages for both organizations and their employees. For organizations, the flexible deployment of their employees is an important competitive advantage since it allows them to match labour supply and demand, as the view of Forrier, A., et al. (2003).

Valverde, M., et al. (2000), argue that given the ongoing war for talent on the external labour market, highly employable employees are a critical success factor in being able to anticipate and react to changes in the organization’s context. When the employees of an organization can be employed along different job positions and tasks, the organization can easily adapt itself to changing market conditions, as per Nauta, A., et al. (2009). Furthermore, organizations who invest in the competency development of their employees are often considered to be an attractive employer, making it easier to attract and retain valuable talent.

According to Forrier, A., et al. (2003), on the side of employees, employability is becoming increasingly important since lifelong employment with the same employer is becoming the exception rather than the norm. As such, it is up to employees to enhance their employability and thereby advance their own job security and career success.
The way employees work at the workplace is a reflection of their personal and organizational skills and competencies. Therefore the alignment of these competencies is the key to the organization’s success. This process contains the overall, core competencies, main applications of these competencies, definitions, types, levels, and description of the essential competencies for the organization and then the essential generic, technical and functional competencies for the organization.

![Diagram of Competencies]

**Figure 2.8: Development of Competencies**

Job-specific competencies are functional competencies that drive high-performance & quality results for a given position. Organizations build these competencies through detailed assessments for vital job functions and sometimes for other jobs as well. This requires regular maintenance and updates as today’s organizations are more dynamic in nature. The development of functional competencies is thus a time- and maintenance-intensive task.

These competencies have the biggest impact on the following:

- The organizations that have highly structured positions, levels and specialized functional areas.
When functional competencies are clear, professionals can easily create such programmes that impel the development of sets of these competencies, which further greatly improves the alignment and effectiveness of training programs.

When selecting competencies, an organization is, in a way, defining how effectively and efficiently employees should perform at the workplace. In this process organizations can either select standard or off-the-shelf set of competencies. They can even design custom competencies through a process of researching and developing behaviours that are most relevant to the organization.

However, some degree of customization is necessary, no matter what approach an organization is adopting, in order to ensure alignment with the institution’s/organization’s culture and strategies. Organizations define, research and develop behaviours, relevant to their culture, industry and work – by observing the work patterns of diligent and result-oriented individuals at their work.

**2.10 Competency Analysis**

Dave, M., et al. (2012) suggest that competency analysis is indispensible for any organization because it helps in deciding the right combination of employee and job, which further enhances the productivity of the employee. Competency analysis is mainly a procedure which involves four steps. The first one is workforce planning. After this, follows the process of sourcing, recruitment and selection. Career planning and development is the third step and performance management is the last to follow.

Competency Analysis has use in the following (as also shown in Figure: 2.8):

(a) *Developing Competency Models* – the analysis helps in determining specifically which kinds of knowledge, abilities and other performance characteristics are critical for job success.

(b) *Performance Management* – it provides assistance for coaching and appraisal purposes.
(c) Developing Learning Materials – with information gained from the analysis, real-life cases, behavioural simulations, etc. can be developed that are not only relevant to the job but also have the significant impact on learning.

(d) Developing Selection Guides – detailed selection questions, etc. can be developed for target jobs.

![Figure 2.9: Competency Analysis](image)

Analysis of competencies is done in order to guide management and staff in strengthening the managerial and technical capabilities of the organization through continuous learning.

The purpose of the competency movement needs to be defined in relation to work and with a focus on the efficiency of management learning. As per Alainati, S., et al. (2011), the dimensions included in this process are:
(a) Micro to Macro: from the micro level (the individual); where they are defined, measured, applied and achieved at work through learning, all the way to the macro level (the HRM, organisational and the labour market) where the labour market and the vocational training system implement work in terms of competency philosophy.

(b) Theoretical to Practical: from the theoretical point of view that influences the ideas and its application to the practical points, where they implement these theories both at the micro and the macro levels.

According to Dorn, J., et al. (2007), the competencies consist of four components called knowledge, skill, attitude and capability. The levels of competency analysed are

- **Practical competency** (an employee’s demonstrated ability to perform a set of tasks)
- **Foundational competency** (an employee’s demonstrated understanding of what and why she/he is doing)
- **Reflexive competency** (an employee’s ability to integrate actions with the understanding of the action so that she/he learns and adapts to the changes as and when they are required)
- **Applied competency** (an employee’s demonstrated ability to perform a set of tasks with understanding and reflexivity).

The competencies are structured hierarchically and contain a differentiation between practical and theoretical competencies/knowledge. For each competency instance exists two values estimating the strength of the theoretical and practical value. Evidences are necessary for computing the strength of a competency as well as achieving trust into certain claims. Learning objects are used to develop or improve competencies.
2.11 Competency Management

According to Berio, G., et al. (2005), *competence management* is the way in which organizations manage the competencies of the *corporation*, the *groups* and the *individuals*. It has the primary objective to define, and continuously maintain competencies, according to the objectives of the corporation.

One of the main way in which competencies can be acquired is through learning processes. Over an e-learning system, two scenarios should be implemented in a competence management system:

- A competence management system should help the enterprise to decide and to plan the overall *trainings*, given a set of possible *learning resources*.
- A competence management system should help employees to decide and to plan his/her own learning, given a set of possible *learning resources*.

The consequence is that a competence management information system can be integrated (or coupled) with an e-learning system. This e-learning system provides fully the definition of learning resources and their relationships with the required competencies. Under the competence acquisition umbrella, we found relevant techniques that can be useful for recruiting the personnel. As an example, agent-based systems such as recommender systems, seeking relevant individuals over a set of interrelated archives (including databases, files and documents).

Alexander, D. (1995), proposed an agenda for studying competence-based learning processes very early on. This agenda consists of the fundamental considerations of what needs to be done and the assessment of the individual’s ability (competence) to carry this out.
According to Hummel, H., et al. (2004), competence-based learning is an approach to improve the effectiveness of educational processes by improving the personalization and flexibility of learning and by using the opportunities that new technologies offer. As per Bersin, J. (2007), competence-based learning focuses on identifying the key competences needed for a job, assessing levels of mastery, and specifying learning to address skill gaps.

The associated competence goals can be described in the same way that the strategic knowledge goals are determined. The operationalization of business goals into knowledge and competence goals – which can in turn be separated into critical success factors and key performance indicators – can be meaningful. Thus, for example, the business goal *development of innovative products* can be supported by the knowledge goal *development of needed competences*. The critical success factor *training of identified competence bearer* can be linked to this goal. The implementation can be measured by the number of trainings.

By using a KM approach, a holistic and integrated concept can be developed on the organizational level that also supports measures on the individual level. Furthermore, this integrated concept promotes the strategic development of knowledge and knowledge bearers, as well as competence bearers.

A knowledge-supporting corporate culture is one of the most important success factors as it enables knowledge exchange and competence development. Thus, employees’ openness to share and learn and a flat hierarchy are needed to reveal individuals’ knowledge and competences without their having to fear negative consequences.

### 2.11.1 Competency Management Process

Competence Based Management is comparatively a modern method to find the means by which organizations/institutions can achieve excellent
performance and also further sustain that good performance. This management approach can explain this method in a methodical and structured manner.

In this method the main focus is on to the competence of an organization rather than the environment in which it functions. Therefore this theory will be useful to understand the abilities of an organization that help it to achieve sustainable better performance.

Competence Management is considered to be based on four foundations of an organization:

- dynamic aspect of competencies
- systemic aspect of competencies
- cognitive aspect of competencies
- holistic aspects of competencies of the organization.

### 2.12 Competency Framework

Defining the competencies that are necessary for success in an organization helps in:

- Ensuring that people demonstrate sufficient expertise
- Evaluating the performance more effectively.
- Identifying skill and competency gaps more efficiently.
- Providing more customized training and professional development.
- Making knowledge management processes work more efficiently.

By collecting and combining competency information, a standardized approach to performance that's clear and accessible to everyone in the organization can be created. The framework outlines specifically what people need to do to be effective in their roles and it clearly establishes how their roles relate to organizational goals and success.
2.12.1 Design Principles of a Competency Framework

A competency framework defines the knowledge, skills, and attributes needed for people within an organization. Each individual role will have its own set of competencies needed to perform the job effectively.

Developing a competency framework can take considerable effort. To make sure the framework is actually used as needed, it's important to make it relevant to the people who'll be using it – and so they can take ownership of it.

Manktelow, J. (2007), has suggested four main steps in the competency framework development process:

I. Preparation
   • Defining the Purpose – Before analyzing jobs, and figuring out what each role needs for success, the purpose for creating the framework should be looked upon. The use of framework will impact the people that are involved in preparing it, and will also determine its scope.

   • Creating a Competency Framework Team – while creating the framework people from all areas of the organization, that will use the framework, should be included. If possible, the aim should be to represent the diversity of the organization. It's also important to think about long-term needs, so that you can keep the framework updated and relevant.

II. Collection of Information
This is the main part of the framework. Generally, the better the data is collected, the more accurate the framework will be. For this reason, it's good to consider which techniques should be used to collect information about the roles, and the work involved in each one.
• **Observation** – People should be observed while they're performing their roles.

• **Interview people** – People should be interviewed either through a sample of people or a group interview. It helps in learning what a wide variety of people believe.

• **Create a questionnaire** – A survey conducted through a structured questionnaire is an efficient way to gather data.

• **Analyzing the work** – Job analysis that includes a variety of techniques and considerations gives the most comprehensive and accurate results. If a framework for the entire organization is created, then a sample of roles from across the organization should be taken. This helps in capturing the widest range of competencies.

As this work is carried out further, the information is organized into larger competencies, so the raw data should be analyzed and grouped effectively.

### III. Framework Building

This stage involves grouping all of the behaviours and skill sets into competencies. It involves the following steps:

• **Grouping of the statements** – Firstly, the behaviour statements need to be grouped into different piles.

• **Creation of subgroups** – It is further break down of each of the larger piles into subcategories of related behaviours. Typically, there will be three or four sub groupings for each larger category. This provides the basic structure of the competency framework.

• **Refinement of the subgroups** – For each of the larger categories, the subgroups are defined even further. If need arises, then the groupings are revised as per the requirement.
• **Identification and naming of the competencies** – A specific competence to represent each of the smaller subgroups of behaviours should be identified and named.

Here's an example of groupings and sub groupings for general management competencies:

- **Supervising and leading teams.**
  - Provide direction and support to staff.
  - Take initiative to provide direction.
  - Communicate direction to staff.
  - Monitor performance of staff.
  - Motivate staff.
  - Develop succession plan.
  - Ensure that company standards are met.

- **Recruiting and staffing.**
  - Prepare job descriptions and role specifications.
  - Participate in selection interviews.
  - Identify individuals' training needs.
  - Implement disciplinary and grievance procedures.
  - Ensure that legal obligations are met.
  - Develop staff contracts.
  - Develop salary scales and compensation packages.
  - Develop personnel management procedures.
  - Make sure staff resources meet organizational needs.

- **Training and development.**
  - Deliver training to junior staff.
  - Deliver training to senior staff.
  - Identify training needs.
  - Support personal development.
• Develop training materials and methodology.

• Managing projects/programs
  ➢ Prepare detailed operational plans.
  ➢ Manage financial and human resources.
  ➢ Monitor overall performance against objectives.
  ➢ Write reports, project proposals, and amendments.
  ➢ Understand external funding environment.
  ➢ Develop project/programme strategy.

Adding levels for each competency is particularly useful when the framework is used for compensation or performance reviews. For doing so, each competency is taken, and the related behaviours are divided into measurement scales according to complexity, responsibility, scope, or other relevant criteria.

IV. Implementation

Steps for implementing the framework:

• Link to business objectives – Maximum possible connections between individual competencies and organizational goals and values should be made.

• Rewarding the competencies – Policies and practices should support and reward the competencies identified.

• Providing coaching and training – There ought to be adequate coaching and training available. People need to know that their efforts will be supported.

• Keeping it simple – The framework should be kept as simple as possible.

• Communication – The implementation process needs to be kept open and honest.