Part 3

THE KNOWLEDGE MANAGEMENT

Knowledge in n.e. is the most valuable business resource. Therefore, managing knowledge is a key component of modern knowledge management. It is owned by people in much greater degree than being used in business systems and organizations. This is evidenced by statements L. Platt, the former CEO of Hewlett Packard: *"If HP knew then what HP knows today, it would be three times as profitable."* (by Frappaolo, 2002, p. 2). Transition of developed and partly under-developed countries in the knowledge economy has resulted in increased awareness of knowledge as a key factor for national economy growth and development. Businesses today operate in an environment of strong competition and advanced logistics channels. Goods and services are estimated to be about 30 percent more than necessary.

In order to survive in such environment it is not affordable to be mediocre, but to strive towards business excellence, to know how to survive in the market, to constantly prepare quality plans, based on information and knowledge, and to make right and timely decisions. Decisions must be adaptable and flexible, faced with the changing dynamics of an overall business and competitive environment, and related to the market trends. Information is crucial for deciphering messages from the environment and more or less predicting the future.

Radical changes in the business environment demand a new concept of management in relation to current practice. The need for knowledge management through the use of various management tools and technologies is imposed, enabling the comprehensive, fast and efficient use of all available data and information, both inside and outside the company. For example, one concrete modern system, which allows a comprehensive and efficient use of information, is the concept of business intelligence (Business Information Management). It is believed that a typical modern organization analyzes only 10 percent of the collected data, while 20 percent of companies, the most, use more than 50 percent of the collected data.

Managing the business information allows the use of remaining data, its collecting and converting into usable information. Managing the knowledge,

through implementing various concepts (discussed below), and using modern business intelligence tools, are necessary to gain a competitive advantage and survival in the markets. Emphasis on the role of knowledge in recent years is the result of significant structural changes in the economy. Today, the highest added value of a product and/or service is created by knowledge, not embedded materials. The result is higher sales innovation, not raw material.

Creating intellectual potential and current management is a new competitive weapon of n.e., where knowledge is the main product. In such environment, knowledge becomes fundamental necessity of life. Global market is focused on demanding, creating and encouraging knowledge (not only in documents or knowledge bases, it is increasingly becoming a part of organizational processes and organizational culture). In doing so, the importance of knowledge is coming to the fore in business management. Therefore, the knowledge management is one of the most important business functions.

Knowledge exists in people and teams, making a total organizational knowledge and potential, that can be measured. It is an intellectual capital of the company, now contained in a total market value. In recent decades, companies and organizations have focused their primary interest on investing in information technology, focusing primarily on explicit knowledge, which is easier to collect, transfer and manage.

The ability of organization is to expand the level of experiential knowledge and to share it with employees. It is still not possible to fully manage the experiential knowledge, however, a part of it could be "captured" by individuals in the organization, using appropriate tools and techniques to identify and measure it in a way that becomes accessible to all employees. Through this process, a part of the experiential knowledge can be transformed into third type of knowledge in the organization - so-called *implicit knowledge*. This knowledge is specific to a particular company and can not be copied. It is an important element of the company's competitive advantage.

For successful application of knowledge management in the organization it is essential to be familiar with the concept representing a series of interactions, crucial for the process of creating organizational knowledge innovation cycle. It is so-called *knowledge chain*, introduced by T. M. Koulopoulos, R. Spinello and T. Wayne in their book *"CorporateInstinct: Building a Knowing Enterprise for the 21st Century"* (1997). There are four elements useful for knowledge management: internal awarness, internal responsiveness, external awareness, and external responsiveness. Internal awareness is the ability of organization to quickly estimate the key competency and overall skills.

Internal responsiveness is the ability of organization to use its knowledge and key competencies by making them as quickly incorporated into new products and/or services offered to the customers and market. External awareness (awareness of the environment) is the ability of the organization to better estimate the status of its products or services on the market, to detect the market trends, customer needs and habits in timely manner, to recognize the dangers of new competitors activities, to take care of the institutional constraints and new regulations and to timely estimate the future market demands. External responsiveness is the ability of the organization to accommodate to market demands, faster and more efficiently than its competitors. This is essential for the survival and competitive advantage in the market.

1. CONCEPT OF KNOWLEDGE MANAGEMENT

Knowledge management in the organization is a systematic process of searching, identifying, generating, systematization, storing, using and sharing of information and knowledge, which employees can create, update and implement in order to gain competitive advantages. It is a combination of certain aspects of human, innovation, strategic, communication and project management, and use of information technology in managing the organization.

V. Makarov (2003, p. 450) believes that knowledge management is the key element of the knowledge economy. The best examples are artificial intelligence and semantic representation of knowledge through computer technology and information and communication technology. According to many authors, knowledge alone can not bring a competitive advantage to the organization, only good managing skills. Modern companies are oriented to the efficient organization of its business functions, which requires highly qualified personnel, extensive experience and contemporary knowledge.

Thus, at the end of the last century was created *knowledge management* (KM) as *"a systematic formation, renewal and application of knowledge in order to maximize the efficiency of the company"* (K. Wiig). His subject has been the sum of knowledge and experience of all employees in the company (organizational component, tacit *knowledge*) and formalized (documented, *explicit*) knowledge stored in databases (information and communication component).

The definition of knowledge within these disciplines includes information that exists in the organization, so employees could implement them in daily operations and business objectives.

B. Masic (2004, p. 16) states that KM is a process through which the knowledge is created, learned, strored, shared and implemented. From the target point of view, it is an effective application of knowledge in all decision-making situations. The knowledge management strategy is based on mutual relations between the basic forms of IC (Gaponenko, Orlova, Ibid, p. 221).

Modern business organizations are increasingly based on intangible assets with ability to create competitive advantage and added value. Parallely with the development of paradigmatic knowledge economy, which emphasizes the role of knowledge in creating economic goods, grows the importance of knowledge management. Its application increases the chances of prospective development, and is based on human resources as generators of knowledge and information technologies as instrumental premises of storage, transfer and application of knowledge. There are several knowledge management strategies, focused on developing the basic forms of IC. *First* strategy is focused on the creation and use of knowledge in the human capital. It answers the questions: How to implement sharing knowledge among employees in the organization?, and How to increase their competency and use it in order to increase competitiveness? *Second* is focused on the creation and use of knowledge within the organizational capital, which refers to the organizational structures, information systems, databases, copyrights, patents, licenses, know-how, etc.

Third is focused on the creation and use of knowledge in the sphere of the external links, using marketing technology. *Fourth* is focused on the optimization of human capital and capital ratio (relationship with customers and suppliers, benchmarking, etc.). *Fifth* is focused on the optimization of human and organizational capital.

It answers the questions: How can individual skills of employees affect creating the elements of the organizational structure and how can enhance the effect of feedback of the organizational structure on employees? *Sixth* strategy is focused on optimizing the relationship between the capital and organizational capital. *Seventh* is focused on moving the knowledge at the same time (synergistic effects) between all forms of IC.

FIGURE 3.1:INTERACTION BASCIC FORMS OF IC
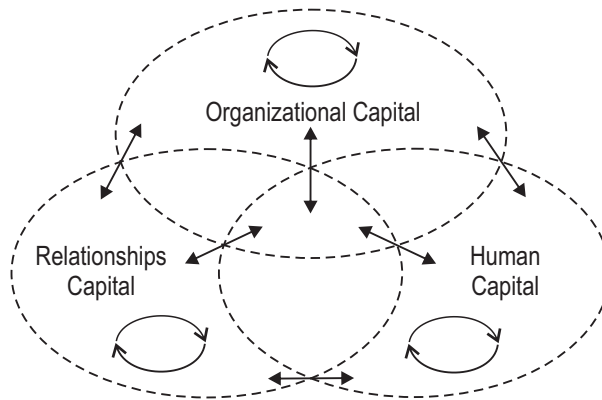
All developed countries are basing their development strategies on expanding IC as the main resource that can provide a competitive advantage in manufacturing. Knowledge as IC (conditionally) has become the main source of creating sustainable competitive advantages of organizations and meeting dynamically growing consumer demand. Benefits from knowledge management are constantly growing. Its influence is essential for creating competitive advantage, economic growth and development. There have been many models and theoretical directions that G. Marinko (2004) classified by technocratic, economic and behavioral approach, according to the criteria taken from M. Earl

In terms of globalization, economic competitiveness of the country depends on the level at which a society and economy are basing the creation of new and implementing the existing knowledge. Nations transfer their comparative advantages from resources to the abilities to implement the relevant knowledge in adopting and realizing important decisions. The transition to the knowledge society and knowledge economy assumes coordinated modernization of social systems, especially the political, economic, educational and cultural. Every delay leads to a halt in all sectors, because they are in direct relationship of mutual interdependence. From the perspective of the knowledge society, it is the dominant influence of the social environment on the education system and growth performance.

TABLE 3.1: VARIOUS SCHOOLS OF KNOWLEDGE MANAGEMENT

School	Criteria	Basic Characteristics
system	technocratic	longer exstistence; based on the tradition of systematic knowledge and expert systems; central idea is to gain knowledge and make it available to everyone who can use it.
carto-graphic	„	schools associated with the presentation of organizational knowledge based on the connection between knowledge and people, with the support of information technology.
process	„	this school is the result of re-engineering business processes, and is based on two basic ideas: a) business processes are stronger when operating personnel provided with knowledge required to perform the tasks, and b) management processes are initially more intense with knowledge of business processes; they are very important contextual knowledge and knowledge-based forms of practice.
commercial	economic	commercial protection foundation and the active use of knowledge in terms of goods and intellectual properties – patents, copyrights and trademarks.
organi-sation	behavioral	intensive use of society to activate the exchange and creation of knowledge, which are often multi-disciplinary and can be inter-organizational and intra-organizational; informal meetings and direct personal exchange of experiences are also used.
spatial	„	based on the use of space and spatial design in order to improve the exchange of knowledge: eg. open type office as a "building" of knowledge; mutual presence and socialization contribute to the exchange of knowledge and the creation of new knowledge
strategic	„	the knowledge management is seen as an indicator of competitive strategy, eg. some companies have declared their intellectual capital as a key competence

FIGURE 3.2: KNOWLEDGE MANAGEMENT GOAL PYRAMID
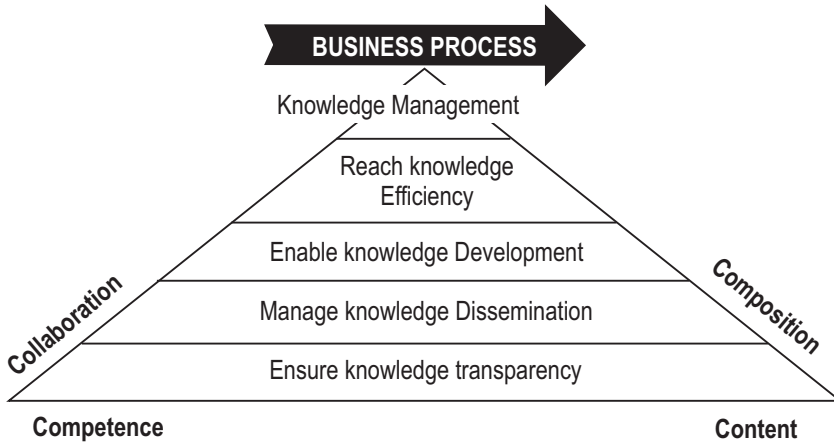
Source: Gerbert, H. et al. 2003, p. 116.

Figure 3.2 offers a way to directly realign a KM model to business processes, in this case the CRM process framework.The resulting CKM model focuses on the management of knowledge about, for and from customers, henceforth summarized by the term "customer knowledge". Knowledge is created, located and captured, disseminated, modified and constantly used within all CRM business processes. Self-orientation of KM is the main reason that many KM models have difficulties proving the value of managing knowledge within a business environment.

However, the model shown on the Figure 3.2 does not require self-oriented knowledge management processes. It requires goals for managing the knowledge critical for its business processes. Therefore, this model transforms the KM process perspective of ontological KM models into a KM goal perspective.

The CKM goal perspective encompasses four goals:

a) *Knowledge transparency* supports the execution of business processes in defining their requirements concerning the manageability of customer knowledge.,

b) *Knowledge dissemination* supports the business process owners in defining the degree of customer knowledge distribution required among all the

individuals who participate in process activities. The management of dissemination requires the management of knowledge transparency,

c) *Knowledge development* supports the business process in defining the requirements concerning the adaptation and creation of knowledge. Although knowledge can be created by an individual, based solely on his or her own context, from a CRM process perspective valuable customer knowledge development requires the ability to disseminate knowledge among individuals. The management of knowledge development therefore requires the management of knowledge dissemination, and

d) *Knowledge efficiency* is based on the diminishing marginal utility of customer knowledge. The goal of knowledge efficiency supports the business process in selecting the knowledge crucial for the CRM process from the large body of knowledge available. Knowledge efficiency requires the manageability of knowledge development, because it necessitates a high level of understanding of current and future customer needs that is essential for enhancing the CRM processes. Since it requires a decision within an uncertain environment, one of the most difficult managerial decisions is to voluntarily destroy or disregard customer knowledge, based on the understanding that this knowledge will actually hinder the knowledge flows within a business process (Ibid.).

FIGURE3.3: DIAMOND OF KNOWLEDGE
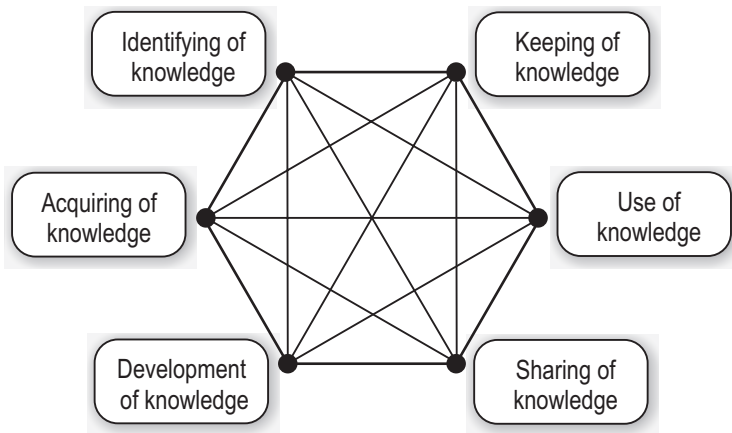
Source: Adapted from Krsmanovic 2004, p. 35.

The assimilation of knowledge (training system) is usually analyzed through the system of *knowledge management*, which can be of varying complexity, depending on the developmental level of business. Small enterprise generally resolves and/or performs specific tasks, so-called *managing tasks* and simple training system.

Medium enterprise (eg. joint-stock company) solves more (group) tasks, consisting of certain business processes (or more), so-called second level, ie. *management of business processes* with complex training system. The third level of business are investment and innovation projects, and appropriate system of training is *management by objectives and projects*. The largest companies form a specific set of values, a corporate and innovation culture and appropriate development philosophy, so the fourth level of the training system is *management by values*. Figure 3.3 schematically shows a combination of knowledge management activities, symbolically called the "diamond" of knowledge.

Accumulation, delivery and management of knowledge (and innovations, based on them) have become an imperative for economic growth and development. Knowledge and innovation, by their nature, content and target orientation, are complementary and interdisciplinary (the subject of many scientific disciplines). Considering the importance of scientific research for economic growth and development, foreign literature have analyzed number of models over the past 15 years, examining and explaining the above mentioned dependence and accumulation of knowledge (Romer 1990; Jones 1998 and others).

It is believed that the ability of an organization to change, to learn faster than others and to rapidly transform theory into practice, is the great advantage. *"The only competitive advantage is the ability to learn and change"* (M. Porter). Country, capital and equipment are no longer a decisive role in the market. Individuals, companies, and even nations, are increasingly dependent on the way in which they develop their skills and apply their knowledge in order to realize their goals. The goal of modern organizations is to view all business processes as knowledge processes. This includes the creating, gaining, storing, sharing and implementing the knowledge, which appears in all cycles of KM. In a rapidly changing and unpredictable environment, where companies seek to create and sustain a competitive advantage, the knowledge owned by organization becomes a decisive factor of the competition. Individual learning is not enough; it is necessary to develop a collective, organizational learning and knowledge. The collective, explicit knowledge and IC, ie. *intangible assets – property,* in the broadest sense, have become the best competitive weapons of our time.

In the era of digital technology, for the last three decades, Internet and Intranet environment have fundamentally changed the ways of doing business. While creating a business in a speed of thought and "*digital nervous system*", B. Gates and C. Hemingway have noted that emerging hardware, software and communication standards were changing business and customer behavior. They have predicted that business would change in the next ten years, more than in the past half century. P. Drucker have noted that today's business theories will not be valid in the next decade. According to him, business theory has three parts:

–   assumptions on environment of the organization (society and its structure, market, consumers and technology),
–   assumptions on specific mission of the organization, and
–   assumptions on core competencies needed to achieve the organizational mission.

Due to a rapid changes, globalization and other complex phenomena, it is necessary to adjust these three assumptions to business theory and practice to a new reality - a new knowledge society. Analyzing information management, T. H. Davenport and L. Prusak gathered managers of 25 companies, among them Hewlett-Packard, IBM, AT & T and American Airlines. Managers were asked these questions: What do they need to know and what they did not know and how they can help them? Surprisingly, almost all of those successful managers have admitted that they do not really know how to manage enriched information and knowledge in their companies. Even the companies on high-tech level, managing to cope with the information revolution, admitted that they had no effective method and approach, that would enable the managing and understanding the information in a way that would improve their use.

In fact, those companies were striving to realize the essence. They were seeking the best practices, new ideas and creative cooperation, that information can not provide, no matter how well managed. This result is possible only by creating an effective use of knowledge. It is clear that most of the required knowledge already exists within their organizations, but it is not accessible at the time requested. Thus, he expressed his belief in the potential value of knowledge, with many executives in the organization.

Companies such as *Dow Chemical* and *Skandia* and consulting firms such as *Ernst&Young*, and *IBM Consulting* introduced positions "chief knowledge officers" and "director of intellectual capital" to study knowledge resources in their companies. They have pointed to the value of saving, improving and enlarging

the productive business results, generated under the influence of KM. Reviewing the concepts that shape the theory and practice of management and that contribute creating the competitive advantages and core competencies of the twenty-first century is not easy, because they are numerous. Here are just some of the most important concepts, created in response to new management challenges:

- learning organization,
- core competence,
- knowledge management,
- total quality management,
- downsizing,
- outsourcing,
- business process reengineering,
- the strategy revolution,
- patching,
- enterpise resources planning,
- balanced score card, and
- e-commerce.

The concept of KM is developing the theory and practice of management. Prospects of further development are high. So-called "century of knowledge", twenty-first century imposes unpredictable and complex competitive environment, where the survival and success of the organization depend solely on its ability to adapt to this dynamic business. Success factors, which will be decisive for the future of the company, are quality, innovation, and creativity. Companies differ among themselves according to their knowledge. Hence the importance of KM as a concept of collective knowledge, directed to the efficient use of knowledge for quick decision making. People will continue to play a central role in the development of the KM concept. Therefore, human resources need to be developed in order to achieve success.

KM is an interdisciplinary business concept, focused on organizational knowledge. It has roots in many disciplines, such as entrepreneurship, business, economics, organization, psychology, and management of information systems. Question of KM is an ultimatum, necessary for achieving competitive advantage. It also includes people, technology and organizational processes as interrelated and overlapping sectors.

FIGURE 3.4: HUMAN, ORGANIZATIONAL, AND TECHNOLOGICAL FACTORS
OF KNOWLEDGE MANAGEMENT
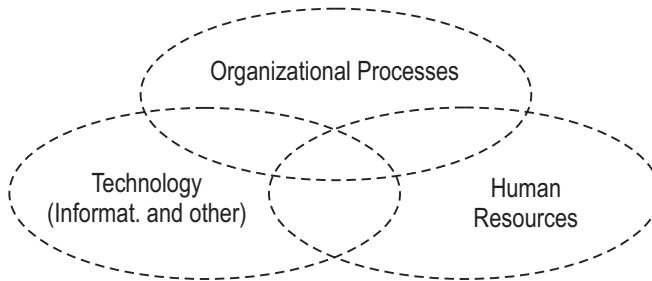
Source: Masic & Djordjevic-Boljanovic 2005, p. 73.

There is no universal definition of KM, and no consensus on what it contains. Therefore, it is best to view KM in a larger context. In short, KM is a process through which organizations generate value of their intellectual assets based on knowledge. Generating usually means sharing knowledge among employees, departments and/or other companies, if that is in the best interest of the company. KM facilitates implementation of technology, but it is not a part of KM by itself. Every definition of KM contains several parts:

– the use of available knowledge from external sources,
– installation and storage of knowledge in business processes,
– products and services,
– storing knowledge in databases and documents,
– promoting the increase of knowledge through organizational culture and employees motivation,
– transfer and use of knowledge throughout the organization, and
– evaluation of benefits obtained by applying knowledge and its implantation into the organization.

Some benefits of KM are noticeable at first glance, but some are not. To receive as much benefits of KM as possible, knowledge must be available to everyone in the company, and its sharing must be the basis for cooperation. An effective KM program should help the company to accomplish some of the following:

- quickening innovation by encouraging the free flow of ideas,
- improving customer service,
- keeping the attention of employees through recognizing the values of their knowledge and appropriate rewarding,
- improving all activities and operations, and
- reducing the costs by eliminating unnecessary procedures.

KM is the adopting and using the collective knowledge and experience of the organization anywhere in the business process - on paper, documents, databases (*explicitknowledge*) or in the minds of employees (*tacit knowledge*). About 95% of information exists as tacit knowledge. It is a driving force for innovation - the only competitive advantage that keeps the company in an unpredictable business environment. The purpose of business is to use modern technology, which allows that knowledge is stored, distributed and spread across the organization and across the system to connect employees with documented knowledge.

The goal of modern organization is that all business processes are viewed as knowledge processes (creating, expanding, upgrading and implementing) across the organization. Creating the added value is done through the identification, application, and the use of knowledge. Organization and its managers should strive to create an explicit knowledge, which is collective by its nature. Every individual can always leave the organization, but knowledge can not disappear because it is contained in a databases and information. It amounts 10-20%, but with implementing the concept of KM it can be doubled.

Y. Malhotra (2000, p. 7) argues that *"KM includes the most important critical issues of organizational adaptation, survival and competence in ever-growing and rapidly changing business environment. Basically, KM embodies organizational processes focused on synergy and combining the data and information, increasing the capacity of information technology, creating and innovating potential human resources."* This is the concept of collective knowledge in the organization, where ultimate goal is the effective application of knowledge in the situations where decisions are made. That knowledge should be available and able to be implemented. Furthermore, the concept of KM is, *"the ability to in relatively short time obtain an information, that will allow everyone in the organization to make the best decision, whether on market conditions, product, service, process, planned activities of competitors or other information important to the success of the company."*

The need for unity is based on differences between "*old*" and "*new*" business world. Old business world is characterized by predictable environment, optimum efficiency, competence based on information and knowledge. New business world is characterized by a high unpredictability of the future. Information benefits, control system and the best practice are no longer sufficient for long-term competence of the organization. The new world is "*re-everything*" (reorganization of everything) and assumes overcoming the usual way of thinking and doing. The application of KM is a matter of survival in the new world of business competition, which differs from traditional methods of solving problems, focused on finding the right answers, but asking the right questions. What yesterday was a success, tomorrow can be a failure. The point is not in *doing the right thing* but in *doing the things right*, so the basis for competition would never be rigidity and incompliance.

The KM process has three stages in its life cycle. According to P. Sydän-maanlakka (2002) KM process has five phases: *Creation*, *Capture*, *Storing*, *Sharing*, and *Application* of knowledge. Figure 3.5 shows connections between the life cycle of KM process and the four essential sectors of the organization.
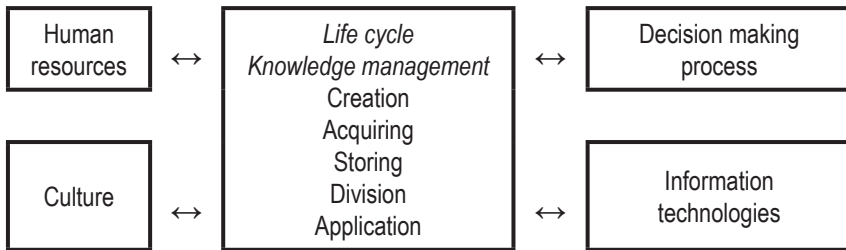
Each of these sectors can influence the way KM is installed and supported in the organization. E. M. Award and H. M. Ghaziri (2004) listed the main areas that need attention in the process of introducing the KM system.

Culture. Changing organizational culture is not a process that can be quickly implemented. The first challenge is to get people to share their knowledge instead of keeping it for themselves. In order to achieve this, it is necessary to change the attitudes and behavior of employees. Only the company that develops the right motivation for employees to collaborate and share their knowledge has a possibility to introduce a successful KM system. Traditionally, employees keep their knowledge for themselves, believing that with sharing they might lose their position in the organization. They think knowledge is the power which no one wants to lose. The KM system must make the knowledge sharing enough attractive so it could last.

Knowledge estimation. Estimating the value of information is a crucial step if the organization wants to revise its method or create a rewarding system for employees who create the "best" knowledge.

Knowledge processing. An effective KM system must provide high-quality collection, storage, processing and distribution of information.

FIGURE 3.5: LIFE CYCLE OF THE KNOWLEDGE MANAGEMENT AND ORGANIZATION

Human resources	↔	*Life cycle* *Knowledge management* Creation Acquiring Storing Division Application	↔	Decision making process
Culture	↔		↔	Information technologies

Application of knowledge. Technology has enabled the cooperation in the field of knowledge, regardless of the time and place. One of the important tasks of KM is to extract the meaning from information, which will have an impact on the application of knowledge in solving a specific problem. Modern companies demand quality, value, innovation and speed as the key factors for achieving success in the future. They will differentiate among themselves according to the level of knowledge. Definition of the company *Sidney Winters*: *"Organization that knows how to do things"* will probably change to: *"Organization that knows how to do new things quickly and well."*

American Productivity and Quality Center (APQC) has identified the main barriers for knowledge sharing. In their book, *If we only knew what we know*, authors C. J. Grayson, CEO and president of APQC, and C. O'Dell, have pointed out four reasons for improper knowledge sharing: *Ignoring*. A person who has knowledge does not realize that someone else can find it (knowledge) useful. On the other hand, someone who can benefit from knowledge may not know that someone else in the company already owns it. *Lack of apsorbing capacity*. Employees often waste time, money and resources looking for the information they need. *Lack of communication among staff*, and *Lack ofmotivation*. People do not see a clear business reason to strive to knowledge transfer.

The main factors explaining the need for studying and integrating KM in modern business are as follows: markets are increasingly competitive and the rate of creating innovation is increasing, the reduction of staff produces a need to replace informal knowledge with formal, competitive pressure reduces the work force, which holds a valuable business knowledge, time devoted to gaining experience and knowledge is limited, retirement and increase of labor mobility lead to the loss of knowledge, change in strategy may result in losing knowledge in a particular sector, most of working positions are based on information,

organizations are competing on the basis of knowledge, products and services are more complex, containing important infor-mational component and need for permanent learning is an inevitable reality.

The best way to overcome human barriers is integration of KM in organiza-tional hierarchy. KM principles must be integrated in order to achieve optimum results. Today, organizations are investing millions of dollars in technology that should allow a better flow of information. However, deeply stored knowledge that exists within the organization remains unused. Sharing knowledge in the right way and looking for new ways that involve breaking down barriers and integration of KM in organizational structure should allow better business. This disconnection between the costs of information technology and organizational operations is a result of transition from the era of competitive advantage based on *the information* and era based on *the knowledge creation*.

Box 17 - Multidisciplinary Nature of KM

Knowledge management draws upon a vast number of diverse fi elds such as:

–   Organizational science
–   Cognitive science
–   Linguistics and computational linguistics
–   Information technologies such as knowledge-based systems, document and information management, electronic performance support systems, and database technologies
–   Information and library science
–   Technical writing and journalism
–   Anthropology and sociology
–   Education and training
–   Storytelling and communication studies
–   Collaborative technologies such as Computer-Supporte
–   Collaborative Work (CSCW) and groupware as well as intranets, extranets, portals, and other web technologies

The above is by no means an exhaustive list but serves to show the extremely varied roots that KM grew out of and continues to be based upon today. Figure B21 illustrates some of the diverse disciplines that have contributed to KM. The multidis-ciplinary nature of KM represents a double-edged sword: on the one hand, it is an advantage as almost anyone can fi nd a famil-iar foundation upon which to base an understanding and even practice of KM. Someone with a background in journalism, for example, can quickly adapt this skill set to capture knowledge from experts and reformulate this knowledge as organizational stories to be stored in corporate memory.

Someone coming from a more technical database background can easily extrapolate his or her skill set to design and implement knowledge repositories that will serve as the corporate memory for that organization. However, the diversity of KM also results in some challenges with respect to boundaries. Skeptics argue that KM is not and cannot be said to be a separate discipline with a *unique* body of knowledge to draw upon. This attitude is typically represented by statements such as "KM is just IM" or "KM is nonsensical — it is just good business practices." It becomes very important to be able to list and describe what attributes are necessary and in themselves suffi cient to constitute knowledge management both as a discipline and as a fi eld of practice that can be distinguished from others.
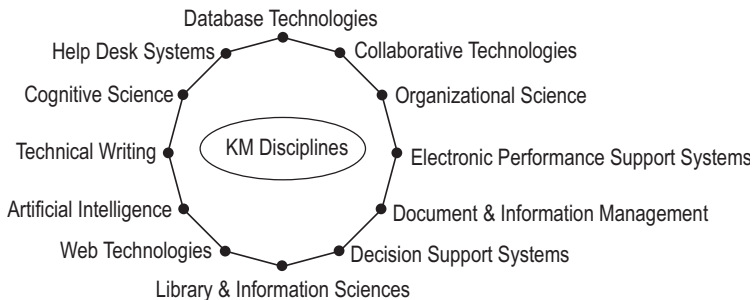
One of the major attributes lies in the fact that KM deals with knowledge as well as information. Knowledge is a more subjective way of knowing, typically based on experiential or individual values, perceptions, and experience. Consider the example of planning for an evening movie to distinguish between data, information, and knowledge.

Data Content that is directly observable or verifi able: a fact; for example, movie listings giving the times and locations of all movies being shown today — I download the listings.

Information Content that represents analyzed data; for example, I can't leave before 5, so I will go to the 7 pm show at the cinema near my offi ce.

Knowledge At that time of day, it will be impossible to fi nd parking. I remember the last time I took the car, I was so frustrated and stressed because I thought I would miss the opening credits. I'll therefore take the commuter train. But fi rst, I'll check with Al. I usually love all the movies he hates, so I want to make sure it's worth seeing! Another distinguishing characteristic of KM, as opposed to other information management fi elds, is the fact that knowledge in all of its forms is addressed: tacit knowledge and explicit knowledge.

B21: INTERDISCIPLINARY NATURE OF KNOWLEDGE MANAGEMENT

Database Technologies
Help Desk Systems ● Collaborative Technologies
Cognitive Science ● ● Organizational Science

KM Disciplines

Technical Writing ● Electronic Performance Support Systems

Artificial Intelligence ● ● Document & Information Management
Web Technologies ● ● Decision Support Systems
Library & Information Sciences

Ruggles and Holtshouse (1999) identifi ed the following key attributes of knowledge management::

– Generating new knowledge
– Accessing valuable knowledge from outside sources

-    Using accessible knowledge in decision making
-    Embedding knowledge in processes, products and/or services
-    Representing knowledge in documents, databases, and software
-    Facilitating knowledge growth through culture and incentives
-    Transferring existing knowledge into other parts of the organization
-    Measuring the value of knowledge assets and/or impact of knowledge management.

History of Knowledge Management

Although the term *knowledge management* formally entered popular usage in the late 1980s (e.g., conferences in KM began appearing, books on KM were published, and the term began to be seen in business journals), philosophers, teachers, and writers have been making use of many of the same techniques for decades. Denning (2002) related how from "time immemorial, the elder, the traditional healer, and the midwife in the village have been the living repositories of distilled experience in the life of thecommunity" (http://www.stevedenning.com/ knowledge_management. html).

Some form of narrative repository has been around for a long time, and peoplehave found a variety of ways to share knowledge in order to build on earlier experience,eliminate costly redundancies, and avoid making at least the same mistakes again. For example, knowledge sharing often took the form of town meetings, workshops, seminars, and mentoring sessions. The primary vehicle for knowledge transfer was people themselves - in fact, much of our cultural legacy stems from the migration of different peoples across continents. Wells (1938), while never using the actual term *knowledge management*, described his vision of the *World Brain* that would allow the intellectual organization of the sum total of our collective knowledge. The World Brain would represent" a universal organization and clarifi cation of knowledge and ideas " (Wells 1938, xvi). Wells in fact anticipated the World Wide Web, albeit in an idealized manner, when he spoke of " this wide gap between… at present unassembled and unexploited best thought and knowledge in the world… we live in a world of unused and misapplied knowledge and skill " (p. 10). The World Brain encapsulates many of the desirable features of the intellectual capital approach to KM: selected, well-organized, and widely vetted content that is maintained, kept up to date, and, above all, put to use to generate value to users, the users ' community, and their organization.

What Wells envisioned for the entire world can easily be applied within an organization in the form of an intranet. What is new and termed *knowledge management* is that we are now able to simulate rich, interactive, face-to-face knowledge encounters virtually through the use of new communication technologies. Information technologies such as an intranet and the Internet enable us to knit together the intellectual assets of an organization and organize and manage this content through the lenses of common interest, common language, and conscious cooperation. We are able to extend the depth and breadth or reach of knowledge capture, sharing and dissemination activities, as we had not been able to do before and fi nd ourselves one step closer to Wells ' (1938) " perpetual digest … and a system of publication and distribution " (pp. 70 – 71) " to an intellectual unifi cation… of human memory " (pp. 86 – 87).
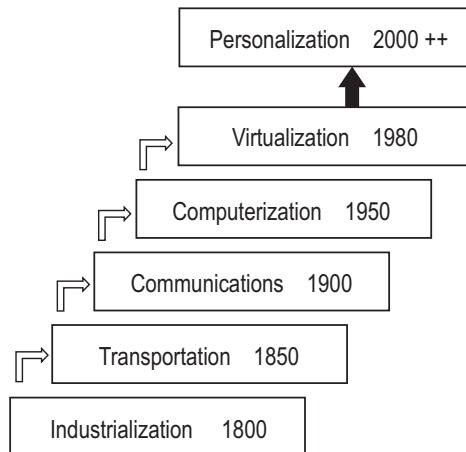
Drucker was the fi rst to coin the term *knowledge worker* in the early 1960s (Drucker 1964). Senge (1990) focused on the *learning organization* as one that can learn from past experiences stored in corporate memory systems. Dorothy Barton-Leonard (1995) documented the case of

Chapparal Steel as a knowledge management success story. Nonaka and Takeuchi (1995) studied how knowledge is produced, used, and diffused within organizations and how this contributes to the diffusion of innovation.

The growing importance of organizational knowledge as a competitive asset was recognized by a number of people who saw the value in being able to measure intellectual assets (see Kaplan and Norton; APQC 1996 ; Edvinsson and Malone 1997, among others). A cross-industry bench-marking study was led by APQC' s president Carla O' Dell and completed in 1996. It focused on the following KM needs:

- Knowledge management as a business strategy
- Transfer of knowledge and best practices
- Customer-focused knowledge
- Personal responsibility for knowledge
- Intellectual asset management
- Innovation and knowledge creation (APQC 1996)

FUGURE B22: DEVELOPMENTAL PHASES IN KM HISTORY

| Personalization   2000 ++ |
| Virtualization   1980 |
| Computerization   1950 |
| Communications   1900 |
| Transportation   1850 |
| Industrialization   1800 |

The various eras we have lived through offer another perspective on the history of KM. Start-ing with the industrial era in the 1800s, we focused on transportation technologies in 1850, com-munications in 1900, computerization beginning in the 1950s, and virtualization in the early 1980s, and early efforts at personalization and profi ling technologies beginning in the year 2000 (Deloitte, Touche, Tohmatsu 1999). Figure B22 summarizes these developmental phases. With the advent of the information or computer age, KM has come to mean the systematic, deliberate leveraging of knowledge assets. Technologies enable valuable knowledge to be *remembered*, via organizational

learning and corporate memory; as well as enabling valuable knowledge to be *published* that is, widely disseminated to all stakeholders. The evolution of knowledge management has occurred in parallel with a shift from a retail model based on a catalog (e.g., Ford 's famous quote that you can have a car in any color you like - as long as it is black) to an auction model (as exemplifi ed by eBay) to a personalization model where real-time matching of user needs and services occur in a win-win exchange model.

In 1969, the launch of the ARPANET allowed scientists and researchers to communicate more easily with one another in addition to being able to exchange large data sets they were work- ing on. They came up with a network protocol or language that would allow disparate computers and operating systems to network together across communication lines. Next, a messaging system was added to this data fi le transfer network. In 1991, the nodes were transferred to the Internet and World Wide Web. At the end of 1969, only four computers and about a dozen workers were connected. In parallel, there were many key developments in information technologies devoted to knowledge-based systems: expert systems that aimed at capturing *experts on a diskette*, intelligent tutoring systems aimed at capturing *teachers on a diskette* and artifi cial intelligence approaches that gave rise to knowledge engineering, someone tasked with acquiring knowledge from subject matter experts, conceptually modeling this content, and then translating it into machine-executable code (McGraw and Harrison-Briggs 1989). They describe knowledge engineering as "involving in- formation gathering, domain familiarization, analysisand design efforts. In addition, accumulated knowledge must be translated into code, tested and refi ned" (McGraw and Harrison Briggs, 5). A knowledge engineer is "the individual responsible for structuring and/or constructing an expert sys- tem ". The design and development of such knowledge-based systems have much to offer knowl- edge management that also aims at the capture, validation, and subsequent technology-mediated dissemination of valuable knowledge from experts.

By the early 1990s, books on knowledge management began to appear and the fi eld picked up momentum in the mid 1990s with a number of large international KM conferences and con- sortia being developed. In 1999, Boisot summarized some of these milestones. At the 24th World Congress on Intellectual Capital Management in January 2003, a number of KM gurus united in sending out a request to academia to pick up the KM torch. Among those attending the conference were Karl Sveiby, Leif Edvinsson, Debra Amidon, Hubert Saint-Onge, and Verna Allee. They made a strong case that KM had up until now been led by practitioners who were problem-solving by the seat of their pants and that it was now time to focus on transforming KM into an academic discipline, promoting doctoral research in the discipline, and providing a more formalized training for future practitioners. Today, over a hundred universities around the world offer courses in KM, and quite a few business and library schools offer degree programs in KM (Petrides and Nodine 2003).

Source: http://mitpress.mit.edu/sites/default/files/titles/content/9780262015080_ sch_0001.pdf

Box 18 - Individuation

FIGURE B23: INDIVIDUATION
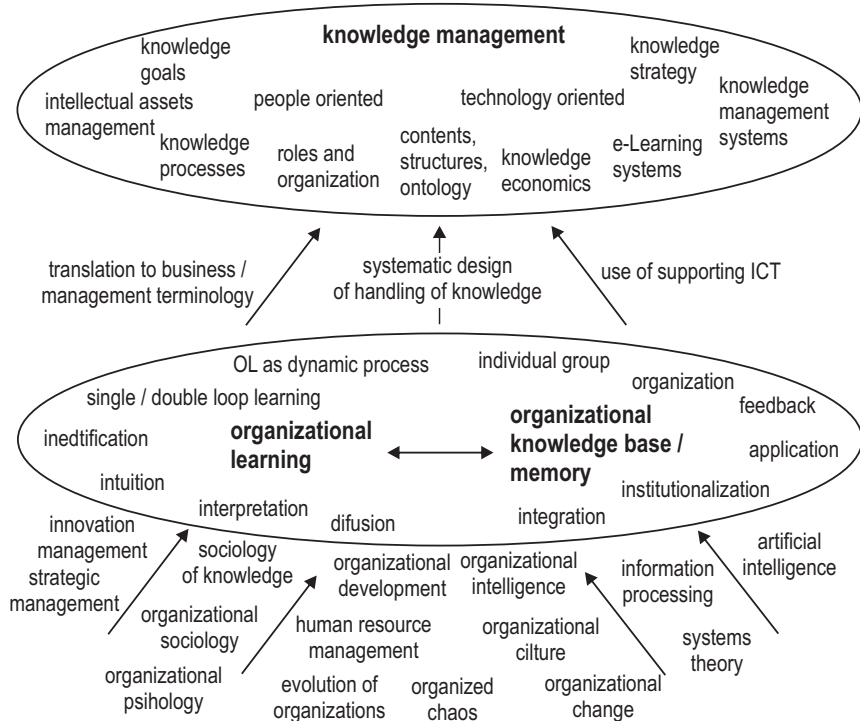
Source: Maier 2007.

2. MODELS OF KNOWLEDGE MANAGEMENT

Science intensity of industries and the resulting increase in the share of intangible assets in the capitalization of the company is characteristic of the modern economy, ie. the "knowledge economy". Information and knowledge in theory and practice are treated as *immediately productive force* and a strategic factor of production. If we ignore questionable hypothesis underlying the

mathematical modeling of the knowledge impact on economic growth and development, applied mathematical and statistical instrumentation and alternation of obtained scenarios (results), there are two important general conclusions: Investments in the knowledge economy sectors are more profitable than other investments; and Positive impact of investments in the n.e. sectors on GDP, in the long term, is greater than the corresponding impact of investment in other sectors.Lately, much has been written about n.e., which is based on knowledge, information and services, dominated by:

– high-tech industries, with low material and labor intensity and high cost of scientific research in the added value, and

– industries of so-called "soft" technologies, dealing with the elaboration of software support, system integration, etc. As these are sectors with high risks and long periods of return on investment, private capital usually avoids them in many states (the most of post-socialist countries) because it strives towards more profitable investments in business and industries of raw material, construction, retail and other. Therefore, in the considered area of innovation often requires an active role of the institute of state regulation. Simplified and most general model of knowledge can look like following.

B. Kogut and U. Zander (1992) were the first to establish the theory of knowledge managament, which underlines the strategic importance of knowledge as a source of competitive advantage. Their work is based on the idea that *"company will benefit more from creating and transfering the knowledge within the organization, than from the market."* Knowledge consists of information and know-how, individually or together. Companies act as "skill storage", defined with social knowledge, obtained through individuals who are connected through organizational principles. They observed that: a) companies are more efficient if they rely on the knowledge, b) the common understanding develops by individuals and groups within the company through interaction of knowledge transfer from the concept to production and markets, c) company has to rely on knowledge to overcome shortcomings of the market, and d) limits of the company are defined by knowledge, not by shortcomings of the market.

Recent work of M. Earl represent a set of heuristics, generated by the model of *Chief Knowledge Officer*. It is about the function of knowledge within the organization, which regulate the activities of knowledge. He distinguishes data, information and knowledge, and lists three categories of knowledge: received (*accepted*) - science (*data*), acheaved (*workable*) - conclusion, opinion (*information*) and potential (*potential*) - experience (knowledge), which is, according to

him, the most valuable, because it has the greatest applicability. M. Earl (1998, p. 7) points out that "*this banal classification with flaws indicates that knowledge consists of expertise, experience, know-how, skills and competence*". Further, he identifies two organizational conditions, important for knowledge management: knowing and knowledge. He believes that the organization should care for creation, protection and encouragement of its knowledge assets using four functions: *inventory* - mapping of individual and organizational knowledge, *revision* - estimating the character and scope of ignorance and knowledge development through cognitive activities, *socialization* - initiating events that creating the possibility to share the informal, experiential knowledge, and *review* - pointing to the problem of ignorance by learning from the experience, through activities and overcoming unusual situation. On those grounds Earl forms his own knowledge management model, which consists of four technical and social components: knowledge systems, networks, workers of knowledge and training organizations (according Barantsev 2007, p. 119).

Model by E. Carayannis is based on *Organizational Knowledge Network* and *Organizational Cognition Spiral*. He (1999, p. 219) proposes a *"synergistic symbiosis of information technology, management and organizational learning",* all linked by knowledge management. Information technology is accessed by adding the value of technological infrastructure to management/organizational knowledge as *"the capacity for individual and mutual acting, learning, expressing emotions and predicting,"* to the knowledge management as a *"socio-technical system of tacit and explicit business policy and practice".* Carayannis was trying to define the systems and structures, real and virtual, which would allow an organization to achieve maximum efficiency and effectiveness of its cognitive processes. Crystallized form of this intent includes the term *Organizational Knowledge Net*. Based on three key elements (meta-cognition, meta-training and meta-knowledge) and matrix (2x2) "consisting of successive knowledge circulation, where individuals and/or organizations overcome four levels of understanding and ignorance," he (Ibid., p. 224) has formulated a model, explaining the situations listed in quadrant matrix (ignorance of ignorance, ignorance of the understanding, comprehension of ignorance and understanding the understanding). Thereby, the actions are focused on transition from one state to another, which is accomplished in two ways: the ability of interaction and concerted actions, supported by information technology. Properly directed actions lead not only to the spiral (expanding) knowledge, but also to increased knowledge of training methods. He argues that the link between *knowledge* and *meta-knowledge* is essential for management knowledge, which is a famous issue in the community of organized learning.

Model by Viig (knowledge-technology-business-management) is based on four assumptions (based on three pillars) for directing the knowledge management, namely: the foundation of the knowledge ma-nagement are answers to the question of who produces the knowledge, how is it used in problem-solving and decision-making, and how knowledge is expressed in the cultures, technologies, and procedures; pillar of the continuous knowledge research; pillar of the knowledge assessment in an business prior, during and at the end of the process; and a pillar of active knowledge management throughout the life cycle of the organization, in all phases of the life cycle of goods and innovation (Ibid., s.120).Societal knowledge management in the Industrial Age was very institution oriented - focused education, research, administrative, and corporate institutions*.* In the Industrial Age societal knowledge management consisted only two main operations: those who construct and create knowledge (education and research), and those who apply and exploit knowledge (mainly working life). We need new solutions*.* One solution is to use an analogy taken from the concepts of organizational knowledge management. In the Knowledge Age we need more operations involving investigation of knowledge needs and making knowledge easily available.

In a knowledge-based society, the requirements for working skills and knowledge change very fast. We need new ways to investigate environmental requirements and experiences and from that basis focus and direct resources, and establish the main goals of public education and research in order to balance better the demand and supply for skills and knowledge. This calls for new ways of communication and knowledge intensive cooperation between working world and the public sector. We need educational reform. The operation mode, content, methods, role of teacher, learning/teaching environments of the whole education chain have to be developed to respond more flexibly and proactively to the needs of knowledge economy. This means a new way of networking among educational institutions as well as with working life. The key knowledge accumulation experience is learning by doing in everyday tasks, in human networks. In the Knowledge Age globalization and virtual communities change the way for creating new knowledge*.* A big part of created knowledge is*tacit,* and thereforenot easilytransferable to colleagues, new employees and students withoutface-to-face communicationor more systematic knowledge sharing. Today, we are faced with information overload and the difficulty of quickly finding needed, meaningful information and knowledge. The Internet and intranets serve a common environment for information and knowledge access, sources and services. But, search engines which we use have e lot challenges. There is a need to find methods to better navigate in information networks.

FIGURE 3.6: MODEL FOR KNOWLEDGE & COMPETENCE MANAGEMENT
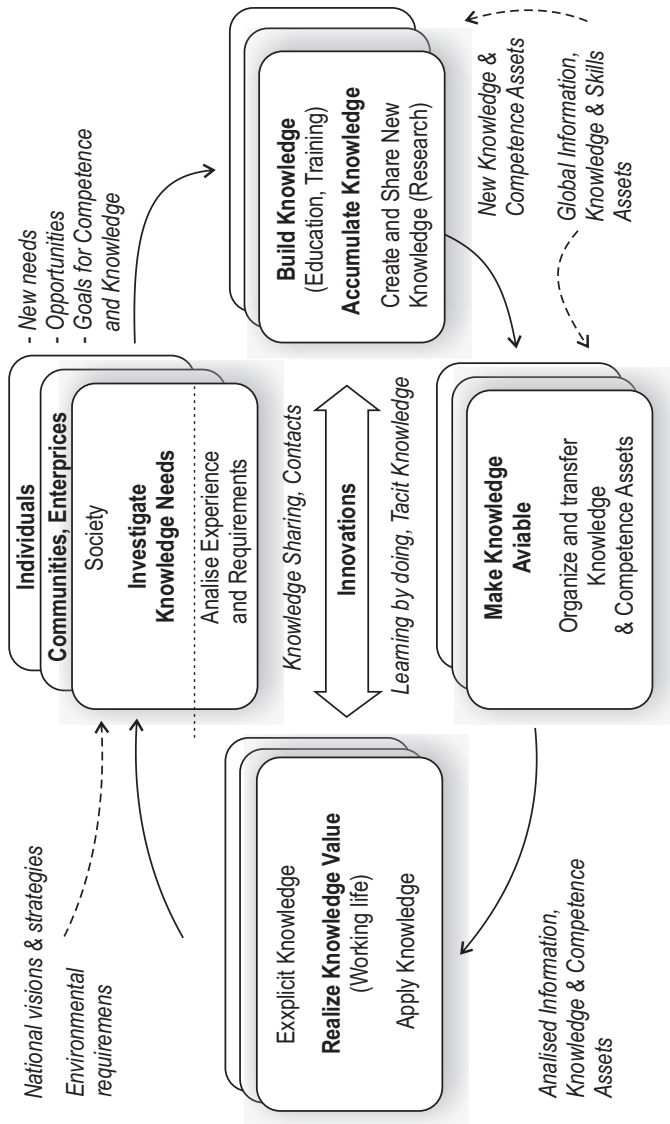
Source: Kautto-Koivula (1998), adapted from K. Wiig 1995.

This could be done by analyzing, organizing and mapping existing information and knowledge assets and by producing meta-level information, information about information, taxonomies. The ongoing development aroundsemantic webis a good example of the right step to this direction. How to apply and exploit new knowledge globally? There are national research centers. Challenges are how small and medium size enterprises and institutional research centers can be supported in developing their operation mode and skills to adopt the new working methods of the Knowledge Age. This requires the globalization of national and regional research centers, support for establishing new value chains and motivation for organizational and individual innovations. In addition to technical innovations, social innovations will become important in the future.

Model by Edvinsson is based on the company scheme, that values the knowledge assets. According to him, there are four components of IC whose interaction creates new value: *Human capital* with its knowledge and habits, which can be converted into value, where the knowledge is in the people, organizational routines and procedures; *Structuralcapital* as supporting infrastructure of the company. It is defined as physical structures (buildings, computers, etc..) and intangible or nonmaterial infrastructure (history, culture, management); *Business assets*, used by the company in commercial processes (the means of production, distribution networks); and *Intellectual property* of the company, which is protected by law. According to Edvnisson, dynamic aspect of this model is related to creating the value with two key sources. The *first* are innovations, which human resources transform into legally protected intellectual assets, and the *second* are products and services, resulting from the commercialization of innovation.

Model by Nonaka (model of four phases: socialization, externalization, combination and internalization - SECI), consists of the following elements: *First*, two types of knowledge:

a) *informalized* (closed: subjective thinking, ideals, shared values, emotions, premonition, personal beliefs, views and opinions, intellectual models, expressed beliefs, approaches to solving problems, skills, technological habits, competencies), and

b) *formalized* (open, public: expressed in words and numbers, simply arranged in a form of balance, descriptive models, mathematical and other formulas, projects, algorithmic processes, business plans, technical documentation, methods, textbooks, lectures, instructions, standards, laws, hypotheses and concepts);

Second, interactive dynamics, ie. knowledge transfer of the mutual actions - handing knowledge from stage to stage, from cycle to cycle; *Third*, three levels of social aggregation: individual, group and context; *Fourth*, four phases of knowledge construction (SECI); *Fifth*, conditions for knowledge construction; and *Sixth*, structure of organization, focused on knowledge.

In addition to these elements, considered model explains following: intellectual approaches and systems thinking in organizations with learning concept by Senge, a knowledge that is produced and used in the dynamic modeling of the business concept by Jansen, a knowledge that is required for the development of models to make a profit and business model innovation, a knowledge needed to manage intellectual capital according to the concept of E. Brooking, and A. Zinoviev, a knowledge that is produced and used in the creative process of solving problems according to the concept of G. Altshuller, and in the process of training according to the concept of G. Dryden, and J. Voss, and knowledge and intellectual productivity according to the concept of P. Drucker.

This model allows analyzing following issues: increase of human resources value, intellectual property rights, competitiveness of business, productivity, mental labor, support of management solutions in the strategic management of innovation and so on. He suggests that a company that creates knowledge consciously facilitate interaction between the tacit and open knowledge ie. four processes of knowledge creation. This is achieved by using the systems, structures and corporate culture that facilitates interaction. In addition: *socialization* is a division of tacit knowledge between individuals through joint activities and physical proximity; *externalization* is expressing the hidden knowledge in publicly comprehensible form; *combination* is the conversion of explicit knowledge into its complex forms: communication, distribution and systematization, and *internalization* is the conversion of externalized knowledge into tacit knowledge at the individual or organizational level, ie. embodiment of the explicit knowledge through actions, practices, processes and strategic initiatives. According to Nonaka, dynamics of interaction between knowledge forms and organizational levels is essential. The key of creation is a spiral that results exchanging formalized and informalized knowledge through various organizational levels, and re-creating the knowledge at the same time. Companies should recognize the importance of the dynamic interaction between knowledge and incorporate mechanisms, enabling interaction between different kinds of knowledge.

Model by Demarest emphasizes the construction of knowledge within organization. This construction is not limited on scientific inputs only, but also includes social construction of knowledge. Thus, constructed knowledge within

organization is product of explicit education programs and social exchange (McAdam and McCready, 1999). It is also a process of expanding knowledge throughout the organization and its environment. Knowledge is seen as an economic resource. This model is attractive because it does not assume any definition of knowledge, but strives to holistic approach. According to R. Frid's (2003) methodology of knowledge management, evaluation of knowledge management maturity level and its implementation can be divided into five levels: the chaos of knowledge, awareness of the knowledge necessity, focusing on knowledge, knowledge management, and knowledge as a center of the organization. *First* level, where knowledge is chaotic, is a stage where organizations are in the process of understanding and implementing. Frid's methodology of knowledge management sets his vision, goals, and indexes. *Second* level (awareness of knowledge necessity) is a step further, where Frid's methodology is recognisable and begins the application on units within the organization. *Third* level (focusing on knowledge) indicates that organizations are focused on the implementation of knowledge management in the engineering process, establishing the initial infrastructure, organizing training, supporting community knowledge, monitoring and informing of achievements in the process of knowledge management application. *Fourth* level implies that the applied fundamental activities are changed and that knowledge management is established as a structured process in the organization. *Fifth* level is the maturity of knowledge management, where knowledge is emphasized as an intellectual asset.

M. Stankosky and C. Baldanzi (2001) have developed a framework for the knowledge management related to learning, culture, leadership, organization and technology. This framework shows that knowledge management includes a wide range of disciplines: cognitive science, communication, individual and organizational behavior, psychology, finance, economics, human resources, management, strategic planning, systems thinking, re-engineering, systems engineering, computer technology, etc.. They proposed four main foundation of the organization, important for knowledge management: leadership, organizational structure, technological infrastructure and learning. Leadership is responsible for the implementation of strategic planning and systems thinking, the best use of resources, supporting a culture that encourages open dialogue, team learning, encouraging and rewarding the risk taking, learning and sharing knowledge. Key elements of leadership are strategic planning, communication, systems thinking and business culture.

Structure of the organization facilitates individual learning and supports communities to collect hidden and explicit knowledge within organizations. It should inspire confidence among the people within organization and to encour-

age free exchange of knowledge and managing the changes. The key elements of the organizational structure are processes, procedures, performance of system management and communication. Technological infrastructure enables the exchange of information without a formal structure. It should increase the effectiveness of transfering hidden knowledge into explicit knowledge and to support knowledge sharing within the organization. Communication, e-mail, intranet, Internet, storing data and systems of decision making are some of the key elements to make this possible. The final pillar of learning is establishing organization that learns and uses knowledge. The role of learning is to control information in order to develop knowledge across the company and be used as a key resource for achieving effectiveness.

Model by G. Hedlund (organization of N-type) refers on organizations based on knowledge, opened and closed, where each has three types of knowledge: cognitive, experiential, and achieved, as well as four carriers: individuals, small groups, organizations and inter-organizational sectors. Driving forces of knowledge transfer are processes of forming and internalization, with reflection as their mutual acting, expanding and adopting, with dialogue as their interaction, assimilation and sowing, referring to extracting knowledge from the environment and inserting it in the middle. G. Hedlund introduced the concept of N-form corporation (1994). He has pointed that N-form corporation exceeds the M-form, being more assimilative to the new imperatives of organizational modeling based on knowledge. Hence, the corporation derives its wisdom from the *"gray zone between economics, organization theory and strategic management"* (1994, p. 74).The main feature of this model is linking two sets of concepts (hidden and open knowledge) and four levels of social aggregation. There is also a driving force behind knowledge creation, development, transfer and use, resulting in a structure made of three basic dimensions: a) two types of knowledge (hidden and open), and within each three forms of knowledge (cognitive, experiential, realized), b) four carriers (individuals, small groups, organizations, inter-organizational sectors), and c) dynamics of knowledge transfer and transformation, articulated in the following processes: formation and internalization, with reflection as mutual acting; expanding and adopting, with dialogue and interaction of assimilation and seeding, referring to *"knowledge that we extract and insert in the middle"* (Ibid., p. 76). Hedlund has laid the groundwork for his dynamic model, making the difference between types, forms and levels of knowledge. He opposes hidden and articulate knowledge from different levels of social aggregation. This results in a classification scheme, which assumes that cognitive, practical and applied knowledge exists in two forms (hidden and articulated) across the organization, ie. at its different levels. On this foundation he builds

dynamics of knowledge transmission and transformation. Knowledge transfer, respository and transformation are presented as a set of processes, whose interaction through various types and levels of knowledge is provided by creation of knowledge and, therefore, advocates the N-form oganizational design.

Model by D. Snowden is based on accessing the knowledge management programs. Snowden has elaborated a system of knowledge, focused on the activity and including four main elements: explicit/experiential knowledge, means of knowledge, confidence and certainty/uncertainty, when it comes to decisions regarding: a) goals, and b) conditional relationships. Matrix and model of decision making shows that organization operates with four types of transition activities: classification of formalized, explicit knowledge using systems and structures, classification of informalized, hidden knowledge through psychosocial mechanisms, transforming hidden into explicit knowledge using *Business Process Reeingeneering*, documentation and releasing hidden knowledge through trust and its dynamics.

A. Inkpen and A. Dinur have introduced an empirical model of knowledge management, designed to explain learning and sharing knowledge between partners in strategic alliances. According to them, *"company is a dynamic system of processes, which involves different types of knowledge"* (1998, p. 454). They continued to explore how companies acquire and use new know-ledge, especially in terms of clustering in alliance. Their model distinguishes experiential, hidden and explicit knowledge, where the key challenge is conversion of hidden individual knowledge into explicit organizational competence. They (Ibid, p. 456) argue that *"creating organizational knowledge should be viewed as a process in which individuals have knowledge, which is magnified and internalized by being a part of knowledge base in organization."* Knowledge conversion, creating and learning are performing in multi-leveled context, initiating different processes, depending on the level. At the individual level, the key is identifying and finding a sense, at the group level it is an integration, at the organizational level, integration and institutionalization.

Model by Van Buren elaborates IC management, where author includes human capital, innovation, process and a client capital. It is a model of effective knowledge management (virtual organization of those involved in knowledge management in different industries). This model includes two sets of criteria (rules) that can be used to evaluate activity of knowledge management in different companies, related to the amount of intellectual capital, including: a) human capital, b) innovation capital, c) process capital, and d) clients capital and set of regulations, directly related to the financial performance and business effective-

ness. Starting point is the amount of intellectual capital in the company, whose identification is used as an input to the knowledge management processes and so-called catalysts. Despite the fact that they are not visible, they are *"starting points which are crucial for improving the ability of knowledge management in the company"* (Ibid., p. 76). The key processes of knowledge management, involved in the activities and initiatives of the company are following: definition, creation, acquisition, distribution, and use of knowledge. Catalysts are corporate functions of the company/systems/ structures that define, initiate and constitute the structure of company activities: leadership, action, communication, process-es, technolo-gies, policies, in terms of human resources and so on. Accent is on interaction process and catalyst, all of which is placed in the context of the company's business strategy - efforts related to knowledge management should be ini-tiated by strategic intent. Output can be achieved through measures re-lated to the financial success and changing the quantity IC. Van Buren suggests various measures of financial success, including the market-book value, return on equity, revenue and value added per employee. He points out fifty criteria of IC, distributed through four categories of capital (people, innovation, processes and customers), including education level, training period, number of copyrights and trademarks, average age of patents, IT access per employee, and annual sales per customer.

2.1 Models of Knowledge Transformation

Dynamic model of Nonaka & Takeuchi's knowledge construction assumes social mutual conditionality of formalized and informalized knowledge be-tween individuals, which is called the knowledge trans-formation. There are four phases of knowledge transformation: *socialization* (from informalized to infor-malized), resulting in positional and targeted knowledge (partnership); *exter-nalization* (from informa-lized to formalized), resulting in conceptual knowledge; *combination* from formalized to formalized (result of systemic knowledge) and *internalization* from formalized to informalized (result of operatio-nalized knowl-edge).

There are two ways to achieve knowledge transformation: *cyclic* and *spiral*. Cyclic means creating and accumulating knowledge in a certain cyclical process, which involves the following relationships: *intellectual models - goal - concept - system - operations - actions*. In all cycles are present four phases (modes) of

creation, ie. knowledge transformations (Figure 3.7). Spiral knowledge creation is a continuous and cyclic process of transforming one knowledge into another: from individual to the collective, from one level of knowledge to another, from informal to formal, and vice versa. In a spiral transformation, which includes a number of alternating cycles, and contains four abovementioned phases, the cycle is completed within one task. Harder tasks are solved in several cycles and in shorter or longer period of time T, while cycles alternate spirally.

FIGURE 3.7: SPIRALMODELOF KNOWLEDGE CREATION
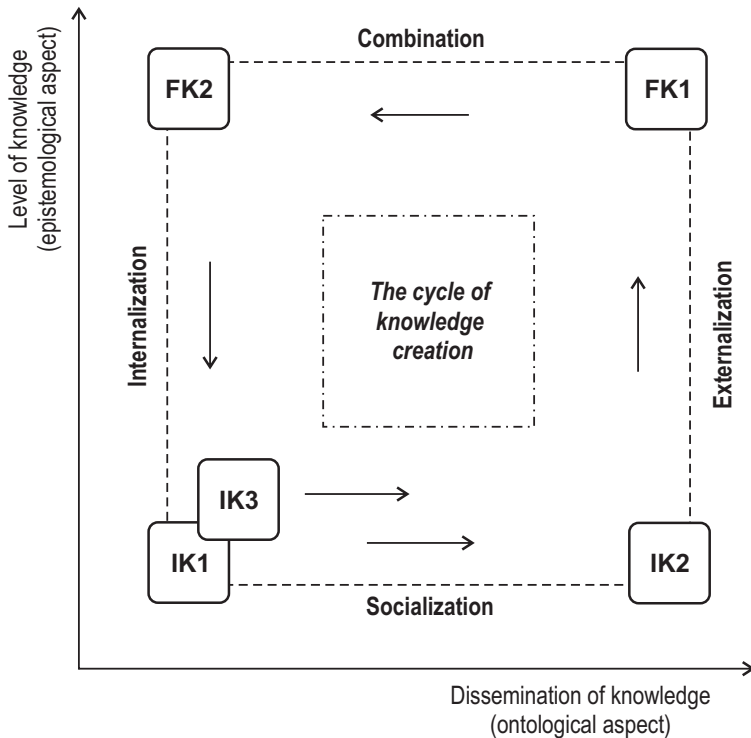
Legend: IK- Informalized knowledge; FK- Formalized knowledge

First phase of the cycle is socialization, which begins with internalization, ie. analyzing previous experience, followed by understanding the situation, identify-

ing its own positions, defining development goals and formulating tasks, where focus is on constructing the positional knowledge and detecting the tacit knowledge (as a sort of hidden, reserve potential). The last step of socialization is delivering knowledge to participants of the next phase - outsourcing.The world is rapidly changing under the influence of innovation. The future becomes more uncertain, with less possibility of the exact predicting. This is largely contributed by the new technologies, goods and services, new methods of financing and management. All of this requires a continuous learning. Therefore, three basic processes (knowledge construction, training, and troubleshooting) must occur parallely and simultaniously, which is essentially the *knowledge spiral*.

The Nonaka & Takeouchi's model clearly explains the knowledge spiral, which includes a number of cycles, and every cycle contains the four stages of knowledge transformation (SECI). *Second stage* elaborates hypothesis as the main idea, followed by concept, and then creates a model of possible strategic solutions. Finally, this accumulated knowledge is delivered to participants the *third stage* - a combination which creates a systemic-detailed knowledge and make decisions for prototype of the project and system plan. In the *fourth stage*, the knowledge internalizations have a character of system experience and operating type, due to a collective opinion of the realized project. With time, memorized details are being erased, transforming into systems and blocks.

TABLE 3.2: THE PROCESS OF CONSTRUCTION; USING, TRANSFORMING AND IMPLEMENTING THE KNOWLEDGE

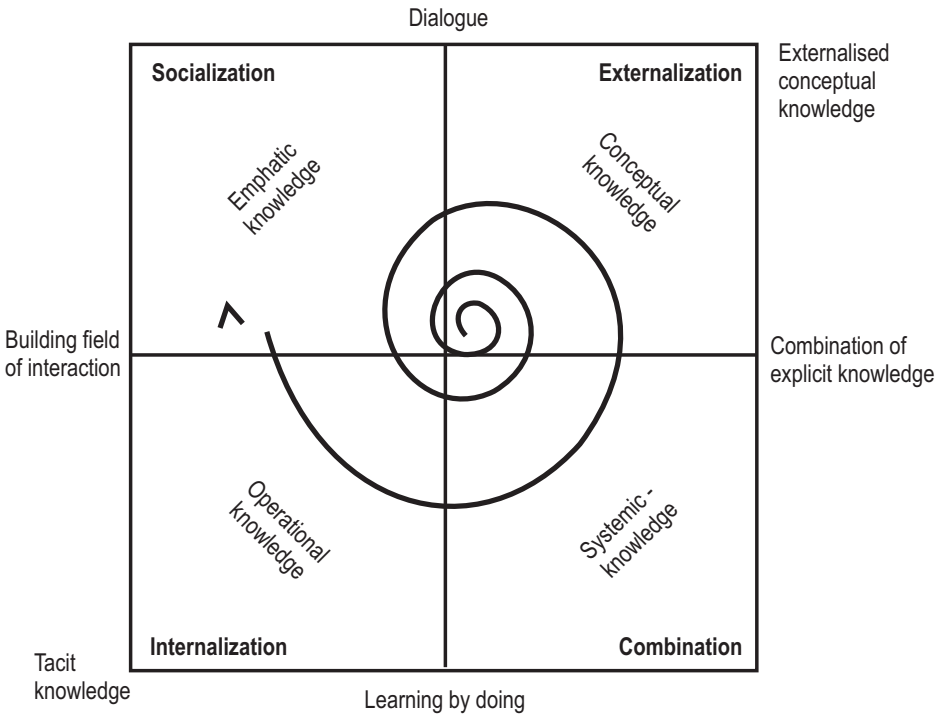| |
|---|
| *knowledge sources:* external and internal ↓ |
| *epistemological aspect:* informalized and formalized knowledge ↓ |
| *ontological aspect*: individual and collective knowledge ↓ |
| *objectivization*: troubleshooting, development and implementation of innovation projects ↓ |
| *methods of knowledge transformation*: socialization, externalization, combination and internalization ↓ |
| *knowledge realization*: goods, services and technology systems |

FIGURE 3.8: THE COMBINEDMODELOF KNOWLEDGE - CYCLIC(PHASE 4),
AND THE SPIRALOF KNOWLEDGE

Dialogue

Socialization	**Externalization**
Emphatic knowledge	Conceptual knowledge
Building field of interaction	Combination of explicit knowledge
Operational knowledge	Systemic - knowledge
Internalization	**Combination**

Externalised conceptual knowledge

Combination of explicit knowledge

Tacit knowledge

Learning by doing

Source: Barancev Ibid., pp. 155-156.

2.2 The Knowledge Creation

Individual learning is an essential precondition for the effectiveness of organization. However, that is not sufficient. Recent studies have contributed a deeper understanding of the group and structure dynamics in the organization, as well as creating a context where learning "thrives" or decreases. Knowledge is analyzed in a context of learning and how the organization can succeed through the use of learning and knowledge as a key resources for innovation, productivity and competitiveness. First, the critical consideration is a widely accepted

hypothesis that harmonization between individual and collective development is a key to competitiveness. Experience shows that this harmonization is not easily achieved in practice. Personal plans and organizational context usually limit the willingness of individuals to express themselves and share their knowledge. Methods and techniques, designed to gather knowledge and experience of individuals, are often not efficiant because they do not resolve the tension that exists between organizational need to control (and systematicly access), and unconformity of the learning process to management and control. Often companies are not able to respond to radical changes in the business environment, because of the atmosphere in which learning and acquiring knowledge is taking place in an organization, not allowing the full use of manager's and employees working experience. Recognizing a special "political" nature of organizational knowledge is a key prerequisite for the successful management of these processes.

Learning is important conceptual bridge, connecting companies with their surroundings, strategy with operational levels of the organization and previous experience with current practice. In order to realize the learning, it is necessary to decide which knowledge is important, so that individual knowledge can best be transfered to organizational knowledge (and vice versa). The question is: Is it possible to systematically manage the most useful forms of knowledge and what is the weight of knowledge drawn from the top or the bottom of the organization? We believe that it is fundamentally important for managers to find the right balance between individual and organizational learning in order to maximize their potential. To check how this could be done, we will analyze three concepts, which have been deployed after 1990: organizational learning, knowledge management, and development of dynamic capabilities. We will briefly look back on their main principles, give examples of how to develop the best practices and stress the lessons that should be learned. Learning and knowledge are the foundation for dynamics of organizational competitiveness, not only as an organizational resource, but also as the main practices and routines. As a linking tool for individual and organizational development, learning is a critical process for supporting flexibility and imagination, a bridge between the operational and strategic priorities, present and future, known and unknown.

Managing knowledge and learning is not easy, particularly in terms of achieving lasting results. Our examples will highlight the important conclusion that learning and knowledge have social and "political" nature. These are not tangible assets that can be measured and controlled. Learning and knowledge are intangible assets, and the power of learning and acquired knowledge is based on their application in systematic ways that contribute developing formal

and informal mechanisms for linking the internal and external environment. A key challenge is the coordination between individual and organizational goals, which should support development of the organization and its dynamic abilities.

So, the following messages are crucial: In learning, for significant contribution to corporate development managers need to be sensitive to policies that support learning and knowledge, and they should be aware of the positive and negative implications of the "political" guided learning plans; Fostering knowledge and learning from internal and external sources and ensuring consistency between the operational and strategic practices are essential; Formal and informal systems and structures must support, not hinder, ideas and information, in order to support collective learning, managers need to pay particular attention to the legitimacy of ideas and experiences arising from operational level, and requires awareness of organizational power and politics; Learning based on success and failure is essential. Success is often attainable, a successful formula can be repeated; Failure is a better teacher, but since no one wants to fail, his potential for learning is not sufficient (if not a profound failure); Learning culture requires a combination of aggressive and rigorous, searching for ideas while learning on mistakes.

2.3 Organizational Learning

In the early 1960s, the idea was that organizations can learn in a way that is similar (with all the differences) to independent learning. Researchers (R. Cyert, J. March, J. Cangelosi and others) have noted that organizations adopted routines and operating procedures, developed over time as a response to accumulated experience and crisis. Through this process, they incorporated the practice and complexity, which were above the knowledge of any person. Some researchers were debating whether valuable knowledge derived from incremental improvements or radical response to major crises. This debate on corporate strategy and innovation (Argyris, Schön, and others) is still actual in the literature. Next major contribution to the study on organizational learning is the work of C. Argyris and D. Schön, in the late seventies.

They have pointed out the difference between incremental and radical forms of learning, with the argument that organizations need to develop a greater ca-

pacity for radical form of learning. They called it a"double loop". It is about learning that involves detecting and correcting errors that occur during modification of organizational norms, policies and objectives. Suggestion was that organizations did not realize the challenge of learning such as "double loop" because managers were reluctant to accept the nature and consequences of adverse news, bad performance or organizational deficiencies. Instead, they established "defensive routines" to protect themselves. This led to a "gap" between their declarative statements and practice. For example, senior managers may verbally encourage radical and critical thinking, but also punish subordinates for suggestions that are radical or critical in terms of current practice.

Theories by Argyris and Schön are often criticized as naive and impractical, because they do not impact the wider organizational system. One decade later, Senge (1990) analyzed them in his book *The Fifth Discipline*, which popularized the idea of "learning organization". He proved that learning must be widely organized, not only based on the behavior of "enlightened" highest managers. His model includes five elements:

– *personal skills* - all employees must develop their own skills through training and education,
– *mental models* - managers must examine their own assumptions about potential discrepancies between theory and practice,
– *team learning* - emphasizing greater awareness of working methods and behavior of groups and teams, whether they support or hinder the collective learning,
– *shared vision* – encouraging creative ideas that can inspire the organization and its members, and
– the *fifth discipline* - systems thinking, which assumes that all the previous elements should be present, because it enhances the effect in the whole.

Senge was not the first one who used the term *"learning organization",* but his work had a great impact for several reasons: his ideas were skillfully systematized, he explicitly enlarged the work of Argyris and Schön and arguments of J. Forrester. His book contains practical corporate examples and was supported by a network of consultants and companies. Years later, many companies have followed the concept of "learning organization", although some were more interested in using this concept for marketing purposes. Here are examples from the 1990s showing that one can find right and wrong activities under the term "learning organization".

FIGURE 3.9:ORGANIZEDLEARNINGMODEL
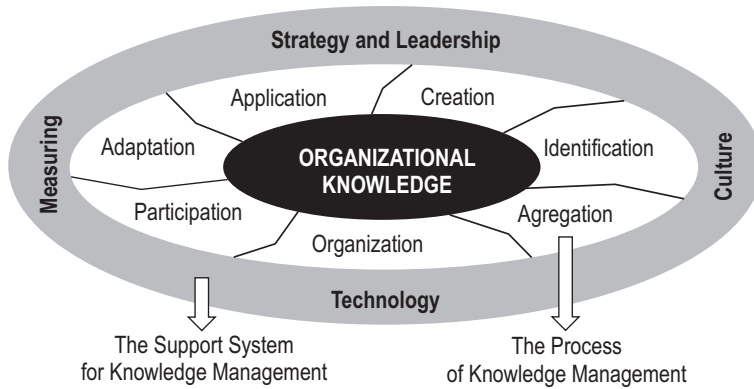
Source: Adapted from APQC, www.apqc.org

In the first case, company *Rover* discussed the contents of "learning organization". *Rover* has been the subject of many studies which showed that its decline and ultimate failure was a result of bad strategy, decision-making, poor production relations and so on. Survived only part of the *Rover* that was a pioneer of "learning organization". *Rover* has established an independent company called "Rover Learning Business" (RLB) in Great Britain (1990) in order to disseminate the principles of learning within the company. Evident feature was the provision of learning opportunities for all 35,000 employees through personal development plans, supported by £100 allocation to spend on any aspect of personal development.

Four year later (1994) senior managers were achieving significant benefits. During the sales of the BMW group in 1994. it was estimated that the development initiatives of people improved shareholder value by £650 million. *Rover* got the *Global Learning Organization* award, as a global leader in the development of learning organizations and for its commitment to continuous learning. *Rover*'s future path was well documented: it was sold to BMW for £800 million, but the new owner was not able to recover it, in 2000 it was bought by *Phoenix* consortium for £1o. Shortly after that, *Rover* went bankrupt. Its reputation as a learning organization has outlived the company's disaster. In an interview, the consultant I. Rose described how *Rover "has become a lighthouse for all learn-*

ing organizations." But a new study has shown that a large part of that reputation was based on rhetorics. Research has shown that systematic calculation of the financial benefits from learning initiatives in the *Rover* did not exist. Most of the information that appeared in the paper were based on a superficial calculations of senior managers on the way to the place of presentation or meeting. Also, the emphasis of the program that teaches the organization is on staff, but in practice it did not seriously spread widely, but everybody in the *"group of chief executives were doing the same - the old way."* On the positive side, the initiative have enabled the significant benefits for individuals, who were enthusiastic. Even employees, who left in the process of workforce reduction were still enthusiastic about the initiative of learning to which they were exposed. However, this had very little effect on the company, for two reasons. *First*, not more than the first principle of Senge's five principles of "learning organization" was accomplished. *Second*, a concept was used by senior managers mainly as a marketing story, and the initiative was not actively supported by their behavior. In short, learning was used as a tool for improving the company's reputation, without a fundamental transformation.

Organizational learning is envisaged in many ways. Dominant concept describes learning as an activity to increase knowledge through changes in organizational behavior, caused by identified deficiencies in performances when creating advanced knowledge (Argyris and Schön, 1978). Insufficient performance is described as a lack of perception, communication and inertia of organizational routine. That is why learning happens when organizational members oppose "the existing theories" (Argyris, 1991) or mental models (Senge et al., 1994), ie. when individual perception does not coincide with reality. In that case, the organization learns. The managerial perception can change and adapt through the process of learning in order to master the new reality. However, creative behavior in the company and constructive response to the changing market environment are also necessary. The above conceptualization of learning is consistent with hyper-competition, where constant innovation is constantly changing the competitive environment.

Organizational learning is defined as a process of purifying and analyzing the changes in existing routine. This type of learning is called "first order learning", "second-order learning", "single loop", "double loop", "first" and "second". According to the first order learning, the existing abilities are improving by training the current practices. In contrast, second order learning creates new knowledge that enables organizations to change practice. Adherence to certain capabilities may become a "trap" preventing the organization to consider new responses to variable market conditions, ie. to update knowledge through learn-

ing. This is an imperative, for only thus can be responded to market changes and, possibly, with implementing the elements of the first and second levels of learning. Learning is individual and takes place in a social organization with the inclusion of cognitive and social basis for communication. Every individual is specialized in organizational ideologies, beliefs, values and norms. These elements of organizational culture may influence the formal and informal organization, and decision-making. Ideology/beliefs and norms have preceded, as well as the consequences of the higher and lower levels of organizational learning. Higher level of learning is a double loop (Argyris, 1991). It reveals the contradictions and resolves them. Detecting contradictions creates knowledge, changing individual and organizational ideology (beliefs), values and norms. Higher level learning affects the entire organization, developing understanding of the causes and complexities, that bring new activities. It is characterized by changes in decision-making and in the organization itself. In contrast, lower level learning (one loop) develops through repetition, in the familiar context, focusing on the behavioral results and formal institutional rules. One loop learning maintains the organizational ideologies (beliefs), values and norms. It allows detecting errors in the system of rules.

Strategic response is realised by application of the learning process at a higher level. That, over time, enables development of corporate value, which is built on famous axiom by Reg W. Revans: For individual to survive, his rate of learning (L) must be equal or greater of the rate of change (C) in the environment, ie. $L \geq C$. This attitude becomes a central value for solving organizational issues. In times of uncertainty, this is vital position, which should exist at all levels of the organization, from the board of executives to the meetings of department managers, from sales teams on the field or engineers for maintenance to the operators in call center. In a complex and turbulent outer environment, traditional hierarchical organization can not successfully implement a higher level learning. This type of organization focuses only on the inside. An effective approach to strategic response means turning the hierarchical pyramid upside down. This enables opening of the organization to the outer environment and updating the knowledge, which is an important aspect of preparing an organization for strategic response.

Perspective of organizational learning is complementary to the concept of dynamic capabilities. They reflect the corporate ability to modify existing and develop new capabilities for creating competitive advantage in a variable environment. Some argue that competitive advantage comes from learning and creating knowledge, which increases the range of possible corporate activities. Creating potential activities is similar to identifying the latent options, which ex-

pand strategic choices available to the management. To the extent that organizations have a variety of alternative activities, the greater is the ability to change their market position in an uncertain environment.

Constant research of external market conditions and opening to the changes is necessary for creating a competitive abilities as a strategic response. The possibility of learning about the changes in the environment is affected by managerial cognitive understanding, which is reflected in its structure of beliefs. To conduct the process of learning and to accept new knowledge and understanding, organizations must reject parts of their existing dominant logic. Changing the prevailing beliefs facilitates adoption of knowledge. Even successful companies show a desire for change. In time, the managerial mental model can disappear, because the existing organizational practice is gradually becoming obsolete. Learning can include a combination of these types of knowledge creation, learning and the process of disintegration.

TABLE 3.3: ORGANIZATIONAL LEARNING AND MARKET POSITIONING

Decision about learning ↓	Concepts (variables). Deciding on a new teaching about the market (endogenous variable of decision making)
Learning about the market ↓	Learning that complements the knowledge of market conditions (costs related to learning)
Market knowledge ↓	Skills based on knowledge that enable firms to adapt its market position
Decisions on adaptation ↓	Deciding whether to reposition the company in the market (endogenous variable of decision making)
Market positioning ↓	Maintenance or adaptation of strategic positioning of the company in the market (adaptation costs)
Economic results	Cash flow generated from the strategic activities (revenues, costs, profits, net present value)

Table 3.3 shows the process of implementation of the proposed approach to organizational marketing learning and positioning. Marketing learning should be a continuous activity of the business process. Its main goal is to coordinate organizational resources (human, financial and physical) with customer's needs and desires. It is a part of the overall competitive strategy context, where advantage has the company closer to the customer.

This process is complex and challenging, because it involves skillful management and number of variables. While some of these variables are under control of the organization (availability, affordability and sustainability) others are beyond the control of interest rates, new legislation, and economic trends. To successfully meet the consumer needs it requires an organized activities-monitoring and valuation of the market environment. Marketing knowledge contributes to the managerial and/or political decision-making. Corporate and strategic managers need reliable information on the market environment and competitors to be able to determine the strategic direction of the organization. Given their importance, marketing information is necessary to collect, organize and apply in a manner appropriate to decisions. In searching for the marketing information, it must be clearly understood what is needed to make appropriate, responsible decisions. Research topics may include internal to external areas. In order to improve the marketing learning, it is necessary to consider: an analysis of market share, market potential and its features, sales performance, business trends, economic forecasts, products, competitors, studies cost, product testing and information systems. Integrated with marketing activities, marketing information is viewed as a resource, but transient and of limited duration. Like other resources, it has a value when used. When managers know less about the marketing problem and when the risk associated with a wrong decision is higher, the information becomes more valuable. There is a strong link between knowledge and the way people use it. Being well informed (educated) is not only having the information but knowing how to use it in action and while interacting with others. In short, knowledge reflects the way in which individuals and groups balance the inherent conflicts contained by what is expected of them, what they expect and, consequently, what they do in the context of the societies where they belong. Social and collective nature of knowledge has become the primary focus of research. It's been shown that practical knowledge is often developed and distributed under the "society of practice" - a group of people dealing with similar issues, whose relationship is based on the their work, reinforced by the social bonds. This informal knowledge is often different from the formal systems and manuals that provide instructions on, for example, how to repair complex machinery or how to navigate the aircraft carriers.

Box 19 -A Conceptual Model of LO and KM

Based on our literature analysis we have developed a holistic conceptual model including both LO and KM. Even if the holistic perspective implies that the model is on a fairly generalized level, it is necessary if the aim, to serve as a basis for developing guidelines for how to introduce KM and the work to become a Learning Organization, should be fulfilled. The model is presented in Figure 26.

The work of Senge (1990) has been widely referred to by both academics and professionals. It covers the main aspects found in our literature review about LO. This implies that Senge's work about the five disciplines should be a central part of the conceptual model. The fifth discipline, System's thinking, is the conceptual cornerstone that underlies all of the disciplines. It is a corner-stone of how learning organi-zations think about the world, and how they look at the world. Thus the conceptual model is shaped as an eye which regards the world from a system's perspec-tive. Personal mastery, Mental models, and Team lear-ning are as we see it different perspectives on the organizational culture. Culture is the result of the or-ganization's accumulated learning about values, as-sumptions etc. It evolves with the strength of that culture; in turn dependent on the length of its exis-tence, the stability of the individuals' membership, and the emotional intensity of the ac-tual historical experiences they have shared. It is the leader who initiates this process by imposing his or her beliefs, values, and assumptions, but culture only arises when individuals´ assumptions lead to shared experiences. The importance of a Shared vision is well stated in the literature. There cannot be a learning organization without a shared vision. A shared vision is a part of the organi-zational culture. The im-portance of the vision is well stated in literature, and the conceptual model must therefore place great em-phasis on this. As consequence, it should be an ob-vious part of the Learning Organization, and not only of the organizational culture.

In accordance with our analysis the model regards LO and KM as system and subsystem. They are two inseparable parts when an organization wants to be-come a learning organization. A LO can be compared to a learning system with distinctive characteristics that are able to meet the demands of its internal and external environments. The model clearly shows different types of both external and internal demands. Learning and knowledge-creating is performed by individuals, but it is important for the organization to provide the appropriate context for them. A LO is an environment that promotes a culture of learning, and that ensures that individual learning enriches and enhances the organization as a whole. This envi-ronment requires a shared vision. To build this type of culture including a common vision is a management responsibility.

KM aims to create value for the organisation. It enables individual learning, and in an orga-nizational perspective this individual lear-ning contributes to both the organizational learning and processes. All in order to reach business values. KM must also be integrated into every mission critical business process, and be adapted to business and knowledge processes. When an indi-vidual learns something he or she obtains new knowledge, which will be stored (hopefully) in their personal memory and used both in its present form but also as a basis of transformation to new knowledge. In order to stimu-late learning of other members in the organization the knowledge has to be stored in the organizational memory, e.g. in books, documents, databases etc. Learning re-sults in more potential knowledge to store, and in this perspective we consider that an organi-zation can learn. The organizational learning depends on individual learning, and when an individual has

learnt the organization as a whole has learnt. This is in accordance with the System´s thinking of Senge (1990).

FIGURE B24: A CONCEPTUAL MODEL OF LO AND KM
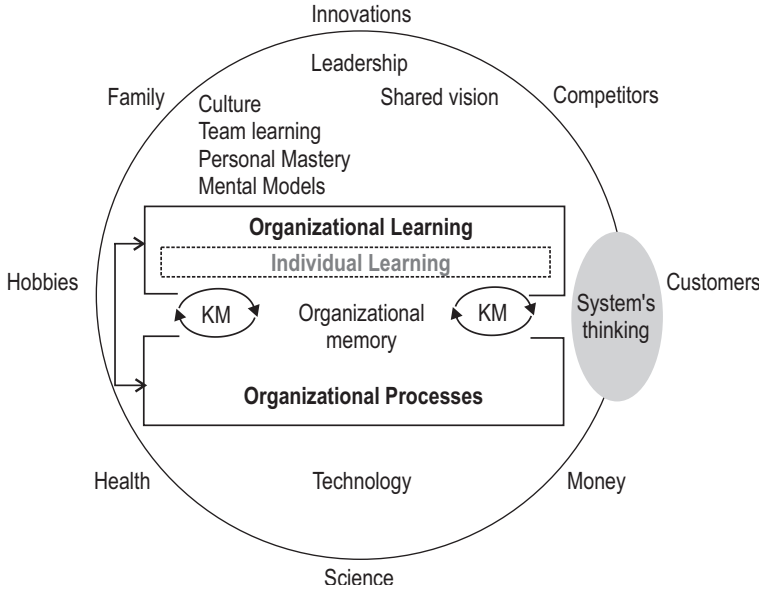
Source: Aggestam 2006, p. 300.

Individual learning becomes organizational know-ledge when organizations function as hold-ing environ-ments for knowledge, and when organizations directly represent knowledge in the sense that they embody strategies for performing complex tasks that might have been performed in other ways. One part of organizational knowledge is stored in IT-supported repositories, organizational memories. When stored knowledge is shared and used it gives rise to learning and possible new knowledge. KM is concerned with new knowledge. It supports organizational learning by both taking care of the result, the knowledge, and making the result reachable for individuals in the organiza-tion. Therefore it stimulates learning and the creation of new knowledge. KM is a prerequisite for a LO, the learning culture must assume that accurate and relevant information must be capable of flowing freely in a fully connected network, but KM's efficiency is in turn dependent on the LO.

2.4 Strategic Knowledge in the Function of Developing Dynamic Capabilities of the Company

The idea of dynamic capabilities is based on organizational learning and knowledge management. Particulary, there is a need for systematic support, integration, learning and crucial role of senior managers. Interaction between and within organizational structures, systems and human behavior, is very important. Strategic knowledge is necessary as a major determinant of value creation in a dynamic and knowledge-based market. Based on this fact, new models should improve strategic knowledge through learning about the market and environment, in order to effectively respond to the challenges of change. New knowledge of environment is gained through information. Knowledge, information and art of their use, with new ideas, are pushing the limits of social-economic growth and development, becoming a core wealth and production resource. New business environment is characterized by telecommunication technologies, satellite, computer equipment, softwares, operating protocols and complex global information infrastructure. In terms of n.e. all of this is increased by the speed of transactions. Therefore, at the company level there is a need for new knowledge.

According to T. L. Friedman, a document that has defined Cold War was an agreement (negotiations between countries). Document that has defined the post-war period was a bargain (negotiations between banks and corporations). The cornerstone of the Cold War was a territory and military power. Final calculation of the cyber era is speed: trade, travel, communication and innovation. Einstein's formula **$e = mc^2$** has been replaced by Moore's Law, where the power of computer chips doubles every 18 months. Innovation has become the driving force of global economic developments. The new economic order is based on knowledge and continuous innovation that rapidly change the market conditions. Global entity is very dynamic, uncertain, turbulent and complex. There is a clear need to develop organizational skills and processes that will answer all of these environmental changes in an efficient manner. These responses must be far-reaching and adapted to the consumer, whose needs are changing in every sense: political, physical, economic, social, technological and commercial. What is the critical change in a relationship between the management of organizational structure and internal processes and the current market environment? It is a new knowledge. A struggle to attract knowledge as the key strategic response. Continuous learning must be encouraged at all levels of the organization and society.

The superior performance of the organization depends on corporate capabilities that enhance the learning opportunities about the current market conditions, enabling it to adapt its strategic position to variable market conditions. Accordingly, we will consider organizational changes, organizational learning, knowledge creation and strategic perspectives for developing a model that encourages understanding the effects of new markets and corporate repositioning. Sustainable competitive advantage must rely on existing capabilities specific to the company, but focusing on dynamic capabilities suggests that the current value creation in relation with the process of learning, which improves the ability of corporations to be strategically sensitive (Teece, Pisano and Shuen, 1997). Discussions about this issue did not initiate systematic research on potential corporate value creation at the dynamic markets. According to Ilintch, D'Aveni and Lewin (1996), "*it is necessary to continue research on how to manage organizations that are under pressure to respond to the uncertainty ... of hypercompetitive environment.*"

In this regard, the key motivation of this review is to improve organizational capacity in order to successfully deal with the complex and turbulent environment. Accordingly, we will emphasize the effects of the value creation through a learning process, which improves the knowledge necessary to change the strategic position in the light of changing market conditions. It is necessary to analyze the effects of changes in market conditions and the importance of learning and adapting the market knowledge. This provides the basis for an alternative policy responses and possible corporate decisions to change market position. Uncertainty is incorporated as a current stochastic change in market conditions due to the influence of hypercompetition, while periodical generating of cash and volatility of cash flow are the main output variables. In an era where the uncertainty is large and information is imperfect, the market exchange has more flaws than transactions within the company. In the old economy, dominated by a high degree of certainty and information predictability, transactions within firms are more efficient than market exchange. This is compatible, with the works of R. Coasea (1937) and O. Williamson (1975), who have set the analytical distinction between exchange over markets and transactions within the company. According to them, size of the company was determined by answering to the Coasea's question (Ibid., p. 30): *"Is it profitable to make additional transactions under the auspices of organization".* Furthermore, they pointed out that uncertainty and imperfect information increase transaction costs within the company. Our opinion is that it increases the risk, especially by the uncertainty of the results. Many organizations are faced with the question: How to increase the confidence in achieving desired results, and how to effectively limit the threat

to acceptable levels and make decisions about research opportunities? Every organization should have a risk management strategy, designed to reduce uncertainty. The application of this strategy, of course, must be based on organizational learning.

3. THE KNOWLEDGE APPLICATION

The knowledge application is the final step in the cycle of knowledge management, including learning, encoding and sharing knowledge, which afterwards enables its application. If the final step is not completed successfully, everything done previously is futile. Knowledge managament is achieved only if the application knowledge is completed. However, today it is imperative to understand what kind of knowledge is needed to specific groups, teams or individuals, and how to make them apply it at work. Knowledge management usually refers to one of two general goals: reusing knowledge in order to improve efficiency and innovation, and introducing more efficient working methods. The knowledge application is related to the actual use of knowledge which has been learned or created and inserted in the KM cycle.

The knowledge spiral is completed by successful internationaliza-tion of knowledge. Internationalization process consists of accessing and understanding the contents, as well as deciding on the best working methods. Therefore, it is applied to decisions or solving problems in real life. Reuse of knowledge is necessary, and also beneficial, and performed to avoid "inventing the wheel". Learning organizations are based on the corporate memory and "knowledge objects." Corporate memory is often incomplete because it includes only explicit knowledge. It is also essential to insert valuable tacit (hidden in individuals) knowledge in the corporate memory, not only for reusability of tacit knowledge, but explicit knowledge. Reuse of explicit knowledge enables the realization of long-term comparative advantages. While reuse of tacit knowledge can be benefitial to individuals, who seek advice from experienced colleagues, the knowledge objects, stored in knowledge respiratory, are available to all employees and as such, they remain purposeful.

Every organization faces many problems in the process of knowledge application. The basic question is: How to apply knowledge in solving various problems; innovation, creativity, intuitive design, good analysis and efficient project

management? Knowledge management systems, which focus on collecting, storing and evaluating various personal knowledge, used in the interaction between individuals, have proven costly and unsatisfactory. Organizations that do not realize the importance of tacit knowledge will repeat mistakes related to this methodology. A common assumption in the past was that all relevant knowledge can to be packed in packages of the "best practices", which can be repeated if necessary. When faced with the reuse of knowledge, as an important issue of knowledge management, there are new issues or, at least, different ways of finding solutions to the problem.

How do we find the necessary components (of knowledge)? How do we gain confidence that these components will do what we need? What is the distance (organizational and geographical) between the creator of these components and its user? Are there people who have used a component of knowledge that we can discuss and learn from them? Do we have access to the author of certain components? What do other people think of the component efficiency? How should we test a specific component?

FIGURE 3.10: INTEGRATED KNOWLEDGE MANAGEMENT CICLE
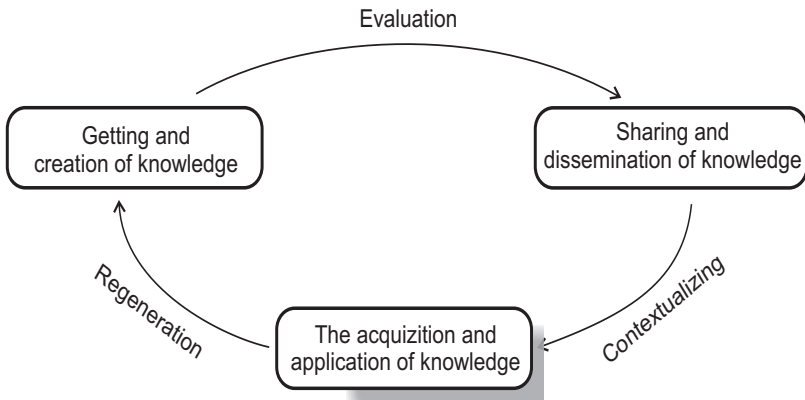
How will this component integrate into our environment? Going further, we will discuss the knowledge application, with emphasis on the key to organizational success in terms of global competition, the ability to collect organizational skills, effective reuse of knowledge gained with effective tools, through synthesis of knowledge, enabling intelligent identification of problems, better strategic

analysis and the best selection of strategic directions. Organizational memory enables making the most intelligent business decisions. This is the case when individuals have access to data, information and knowledge that is stored in organization respiratory. However, just taking the stored knowledge is not enough. It must be accompanied by the knowledge application, and the success of its application is a function of individual characteristics, knowledge content, purpose of its reuse for particular task and the organizational context or culture.

Individual differences play an important role in knowledge sharing behaviors. Knowledge workers differ in terms of familiarity with the subject and in personal and cognitive style. Cohen and Levinthal (1990) found that knowledge sharing rather happens when there is a basis of relevant prior knowledge. A number of studies (eg. Ford et al. 2002; Kuhlthau, 1993, Spink et al. 2002) have found a significant correlation between online behavior in research and cognitive styles of learners. On the other hand, the business world favors the use of instruments, such as *Myer-Briggs Type Indicator*) for evaluation of personal style (Myers et al., 1998). Several studies have been conducted to explore the interrelationships of MBTI type with behavior in the knowledge transmission. In a study of *Waterhouse Coopers* consulting firm (1998), Webb showed that a strong personality is very important in dissemination and sharing of knowledge, regardless of qualifications and prior experience. Characteristics of the person, who wishes to apply or reuse knowledge, also affect the efficiency of finding, understanding and using organizational knowledge. Individual characteristics may include, for example: personal style, preferences in learning and receiving information, and the best methods of putting knowledge into operation. A good framework is Bloom's taxonomy of learning objectives (Bloom, Mesia, Krathwohl, 1964), created to help teachers to set learning goals for learning activities. It can be easily adapted to objectives of the knowledge application for each object in knowledge respiratory.

One of the ways to personalize knowledge is imagining the company with one person or a library with one person. In such assumption, all sources of knowledge are available to one person, reflecting its preferences, its education and so on. Personalization and profiling are currently popular means of characterizing a particular website visitors. This is particularly true in virtual shops, where data on consumers can be analyzed to improve market efforts. However, in the knowledge management we are less concerned about the collection of data for the marketing profiling and personalization, and much more about opportunities to ensure that finding information and knowledge application are conformed to every knowledge worker. If a knowledge worker easy find, understand and internalize certain knowledge, he will then succesfully apply that

knowledge. Instead of using profiling technology, for better understanding of the consumer can be used similar techniques to monitor trace of individual interaction with a set of corporate memory interface. This alternative approach will create a user model, which helps to better understand the types of interaction by the worker, in order to optimize the knowledge application within organization. For example, push technology is based on user models that look at historical information requirements, in order to push or automatically send a similar new content, which becomes available. We should be able to find and use content based on personal model of individual and his prospective of the reality. It is usually influenced by his education (eg Information Technology vs. Sociology). This model is often represented as a semantic network.

There are also systems that monitor user activities on-line and interpret it in context, based on the traces they have left behind. They are successful for the tasks that are well identified and where knowledge can be described in a clear ontology (eg. a template for the mailing address). This approach is based on user interaction with a computer system in order to perform the tasks that lead to system changes. Observer (software routines) detects these changes in accordance with observation model for generating the logs or records. Trace is then analyzed in order to identify and separate significant episodes, which are interpreted in accordance with given explanations for each job (task). Each episode is a pattern (model), which can be mapped to a task, subtask or specific step, which is a part of the subtask. For example, if user tries to locate, open, print a file, there are three episodes of behavior related to locating, opening and printing the file. These episodes can be used by agents assistants that help users in work. Episodes performed by agents can be reused in the future. That way, the system has modeled behavior of the user and can recognize how and when to take certain jobs (tasks). An important factor is that the user modeling is continuous process, not a one-off. Dynamic profiling system should be developed by combining human and automated means of monitoring, in order to continuously adapt to a changing environment, organizations and individuals (different job responsibilities, different preferences, new skills and new interests).

3.1 Bloom's Taxonomy of Learning Objectives

Bloom (1956) has classified knowledge within a hierarchical scheme according to psychomotor skills, affective domain (eg, attitudes) and cognitive do-

main (eg, knowledge). Cognitive domain is often used, although the changes in attitude (affective domain) are often required in knowledge management. Bloom points out that learning is hierarchical, ie. learning (objectives) at the highest level depends on gaining knowledge and skills at lower levels. Cognitive domain of taxonomy is shown in Table 3.4. The levels are: knowledge, comprehension, application, analysis, synthesis, and evaluation.

The affective domain includes emotions, such as feelings, values, appreciation, enthusiasm, motivation and the like. Psychomotor domain includes physical movement, coordination, and motor skills. Developing these skills requires practice. It is measured in speed, precision, distance, procedures, or techniques.

TABLE 3.4: BLOOM'S "COGNITIVE DOMAIN TAXONOMY"

Level	Description	Verbs that can be used
Knowledge	Remembering previously learned material.	Underline, repeat, define, describe, guidance, identification, labeling, matching, naming, formulation.
Understanding (cognition)	Ability to understand the meaning of material (eg, translation from one format to another, an assessment of future trends, explain or give examples).	Classification, conversion, discussion, explaining, generalizing, giving examples, paraphrasing, rewording, summarizing, reviewing.
Application	The ability to use learning materials to the new and concrete situations by applying rules, methods, concepts, principles, laws and theories.	Articulating, assessment, computer design, determination, development, discovery, establishment, expansion, operationalization, participation, forecasting, provision, showing, solving, use, application, demonstration, sketching, practicing, illustration.

Analysis	The ability to divide the material into components in order to understand its organizational structure. Identifying the parts, relationships among parts, accepting the organizational principles.	Analyzing, correlation, diagram, differentiation, focus, reasoning, showing, displaying, acceptance, detachment, division, comparation, enumeration, relating, research.
Synthesis	The ability to assemble the parts in order to form a new whole. Creative behaviors emphasized in the formulation of something new.	Customization, categorization, collaboration, combining, communication, preparation, creation, design, facilitation, formulation, generation, incorporation, individualization, initiation, integration, modeling, proposing, preparing, organizing.
Evaluation	The ability to evaluate the material based on specific criteria.	Assessment, conclusion, criticism, decision making, defending, judgment, justification, evaluation, evaluation results, priority, choice.

These taxonomic categories can be used from "inside out" in order to understand what users are trying to do. The level of internationalization can be identified for effective enforcement. For example, one can set a minimum level for worker to understand and properly use the object of knowledge. This feature can be incorporated in response to the user model. Bloom's taxonomy is a means to determining not only worker's knowledge (skills or expertise), but the level of performance that is expected (higher level). Using cognitive skills of Bloom's taxonomy enables qualifying a particular object of knowledge, for example, the most appropriate practical procedures on how to successfully present a summary of the project team in the preparation of project proposals. Knowledge worker preparing an offer should have a level of understanding that enables critical judgment necessary to accomplish the task for the required knowledge level. He must not only be skilled in selecting team members to be included in the proposal, but also to overlap their resume into a form that proved to be the best in the previous practice.

Another example, when using the affective domain of Bloom's taxonomy, again can be used in the best practice, but this time must be determined the best method of evaluation whether candidates who meet the required technical skills also have the matching "fine arts", such as team work, collaborative approach to work, individual knowledge at the expense of group work. Bloom's taxonomy provides a good basis for estimation of the methods for knowledge application. Often in the KM, using some contents of knowledge base means that they are applied or re-applied. However, this methodology is far more useful to estimate how learning affects the knowledge, stored in the knowledge base, particulary how it affects the new methods. Only through behavioral changes can be concluded about the effects of the knowledge use, and Bloom's taxonomy provides a detailed framework for assessing the extent to which knowledge is internalized (using Nonaka-Takeuchi model of 1995). For example, at lower-levels of cognitive skills, clear recognition that knowledge exists in the organization can easily be seen, because the workers are able to locate content within the knowledge base. Access is monitored through statistical log fail, which is similar to the number of visitors attracted to the website. The knowledge application, however, requires that knowledge workers achieve a much higher level of understanding, such as analysis, synthesis and evaluation. Only at these levels the knowledge is truly applied. Opposite to someone who points out the templates to knowledge base, knowledge application will manifest itself in the way the employee performs at his work.

3.2 The Knowledge Application at Various Levels

Knowledge Management Systems (KMS) are tools oriented to support knowledge management. They have evolved from tools for information management that have integrated many aspects of collaborative working environment with a system of information and documents (Ganesan, Edmonds, Spector, 2001; Greif, 1988; Kling, 1991). The key features of the KMS are support: communication among different users, coordination of user activity, cooperation between user groups on the creation, modification and expansion of the products and controlling processes to ensure the integrity, and monitoring the progress of the process. Systems that support KM provide specific functions related to: communication (e-mail and discussion forums); coordination (divisible calendars and task lists); cooperation (divisible objects and workspaces); control (signs of internal control and automatic version control). KMS focused on

user contributes to the organizational culture of cooperation by giving sense to the community of users and supporting reciprocity among users (Marshall and Rossett, 2000). KMS expands horizons of employees as knowledge workers by giving them the means to create knowledge. KMS supports many information functions, including: learning and indexing, collecting and archiving; finding and evaluating; creating and applying; combining, comparing and modifying, and monitoring (Edmonds and Pusch, 2002).

These KMS features enable the individuals to arrange significant activities around divisible objects, which can be reused to achieve specific goals. KMS is based on distributive nature of the work and expertise (Solomon, 1993). In the business and commercial activities, KM technology is used to support organizational learning (Morecroft, Sterman, 1994; Senge, 1990). Dynamics of the global economy puts priority on organizational responsibility and flexibility. Partly as a response to the highly competitive global economy, KMS technology has emerged as a new generation of information management systems. In contrast to previous systems of information management, KMS is designed for multiple users with different and changing requirements. The key KMS technologies include object orientation, extensive communication and adaptive systems. Object orientation enables creating knowledge that can easily be found, modified and reused. For the users separated in space and time, wide communication provides to work on large data objects efficiently as a team. Adaptive systems recognize that different users may have different requirements and preferred working styles. MS can be regarded as a system of activities involving people who use the facilities (tools and technologies) to create objects and products that represent knowledge in order to achieve the goal of being divisible.

Previous systems of information management were focused on a small part of such a system, like a small set of objects in the form of a recorded collection or simple communication between team members. KMS includes a whole system of activities, but it still focuses on the aspect of human-users (people with common goals), not on the technolgy. KMS has already achieved considerable success in business and is spreading to other sectors including education (Marshall, Rossett, 2000) and instructional design (Ganesan, Edmonds, Spector, 2001). Architecture of organizational knowledge management has at least three levels: *data layer*, which is a unified abstraction through different types of data, with potential mechanisms for storage (eg database, video, audio), *process layer*, which describes the logic that links data with its use and users (other people or systems using data) and *user interface*, which provides access to information resources of the company, through logic incorporated into the process layer.

KM can not support the simple integration of mass data. It requires structuring and navigation of content with the support of meta-data, a formal description of the content and relationships with other objects or content knowledge. Meta data includes a number of tools and techniques available for the implementation of knowledge application in the KM cycle. Tools for spreading and publication include certain design type of stored knowledge. It will have features, such as routing and delivery of information to those who need it (push vs. access. Pull). E-mail or workflow are examples of technologies that work on a "push" priciple, informing users of any changes, new contents or information on expired content. Harmonization of forms can be done for user profile in order to determine where to push the content. Other tools help structure and navigate through content. They provide a classification scheme for organizational knowledge assets. Such navigation is to be found in the user interface. When content is properly indexed and organized, many windows can be available for the same content to meet the needs of the user and the task.

3.3 The Knowledge Reuse

Reuse of knowledge includes withdrawal and acceptance, as well as the actual knowledge application, if using Bloom's taxonomy. The knowledge reuse starts with formulation of questions for the search. Here could be seen the difference between the professionals and expert, who knows the right questions. After quiring the system, begins quiring the expert knowledge using a system of location expertise, then selecting the appropriate expert, and/or council, and after that knowledge can be applied. The knowledge application may include general instructions and its adjustment to the situation, which sometimes refers to *knowledge recontextualisation* (where decontextualisation has occurred to a certain level while collecting and codifying a knowledge). There are three main roles required for the knowledge reuse: *knowledge creator*, a person who creates or documents the knowledge object; knowledge mediator, one who prepares knowledge for its reuse by indexing, cleaning, packaging or marketing the knowledge object; and *knowledge re-user*, who takes over, understands and applies the knowledge.

However, these roles are not permanent nor the same person simultaneously performs all of them. The knowledge repackaging is an important step in adding value, a step that may involve people, information technology or, often,

a combination of both. For example, automatic classification systems may index the content, but the loop almost always requires a man to confirm and add context, command for suspension and other useful indicators for effective use of that knowledge object. Markus (2001) suggests that there are *four types* of knowledge reuse situations pursuant to individual who performs the knowledge reuse which is fully compatible with a user and with the approach adjusted to tasks referred in this section. These are the four following situations: team work of knowledge producers, creating knowledge for its reuse; team work of practicants, working together and reusing knowledge of others; seeking expertise from novices; and sorting the secondary knowledge. Team work of knowledge producers is usually performed in collaborating workgroups. A common example is the MD, who reads the patient's chart to determine diagnosis by other doctors or teachers, dealing with special education, or by therapists who issue the student files, to determine which interventions have been done to the patient. This is the easiest way to re-use knowledge, because everyone is familiar with the knowledge content. They share the same context, which makes the knowledge use quick and effective. Practicants who share knowledge are members of the same professional community. This form of knowledge reuse requires a higher level of personalization and filtration. Re-users need to confirm the credibility of the knowledge. They must believe that the content is valid and should be applied. Their contexts will not completely overlap, so the knowledge reuse will require contact with others, who are familiar with the knowledge object.

Beginners eager to learn are often found in the learning scenario. Unlike the previous two types of re-users, beginners are the farthest or the most different from the knowledge object's author and those experienced in their use. Knowledge mediators have a greater role in ensuring that novice access to general information (such as FAQs, introductory texts, glossaries), before attempting to apply the knowledge object or to contact experts in using the same. EPSS and other kind of support, such as e-learning modules, which are also of great help to re-users. Secondary knowledge miners are analysts, trying to extract interesting patterns by studying the use of knowledge respository. They are analogous to the librarians, who periodically join the collective possession of the library, whether physical or digital, in order to see which items are not actively accessed and, perhaps, should be archived or replaced by newer and better practices. Different types of re-users will in many ways be associated with the knowledge respository and will differ in needs for support. Therefore, respositories should able to personalize each individual differently or at the level of appropriate community.

The knowledge respositories are usually intranets or portals of certain type, used for storing, managing and influencing the organizational memory. Currently, there are different types of knowledge repositories, which can be categorized in different ways. A knowledge repository contains more than one document (Document Management System), data (Database) or records (Records Management System). It contains valuable content, which is a mixture of personal and explicit knowledge based on the unique experiences of individuals who are or have been part of the company, as well as the knowledge that has been used, tested and proved to function in work situations. There are so-called *Data Warehouse*, which include a collection (set) of data, isolated from external and operational base, and stored in a separate database ie. data warehouse. R. Kimball (2000) in his book *The Data Warehouse Toolkit: Practical Techniques for Building Dimensional Data Warehouses* defines a data warehouse as a copy of company's transaction data, specifically structured and tailored for querying and analyzing. Here, data is collected and organized to be accessible to managers, so they can quickly and easily use it for the analysis of their business. According to B. Inmon (1992), data warehouse is subjectively focused (on object), integrated (in the same format), related to time and essentially unchangeable data set, in order to support management decision-making.

The main goal of a data warehouse is to release information "locked" in the operational databases and to "mix" them with information from other (external) sources (data of the competition, demographic trends, sales trends, etc..). Information "highway" provides access to a growing number of data sources. The main function of a data warehouse is the collection of data and the creation of a logical and integrated subject-oriented information. Multidimensional data structure provides great opportunities to explore many details of analytical processing such as aggregation and detailed performance (*drill up, drill down, drill through, cross tabulation, slice and dice requirement*), rotation and the highlighting one dimension while others are in the background (pivoting), forecast modeling, graph (charting), statistical analysis (trend, clustering) and so on. These techniques enable continuous finding new information for managers, to serve them in strategic, tactical and operational decision-making. By introducing the concept of data warehousing, operational bases are no longer burdened with complex queries. The whole information system now consists of two parts: operational and data warehouse, which is more efficient and easier to control and restructure. To meet its goal, a data warehouse must meet the following requirements: access to all employees, a large amount of detailed data, continuous refresh (update) with new data, immediatelly when a business event occurs, a continuous availability and design so it can serve each purpose, the ability to

capture and interconnect data in order to get all the performance indicators of the company (*slice and dice*), filtered data and confidentiality of sensitive data.

TABLE 3.5: REVOLUTIONARY STEPS IN STORING DATA

Period	Steps	Business inquiries	Techno-logy	Features
60's	data collection	what is the total income in the last 5 years?	computers, tapes drives	static delivery of historical data
80's	access to data	what was the sales in certain retail units in an area over a period?	relational database, SQL, ODBC	dynamic delivery ofhistorical data in a single level
90's	data warehousing and decision support systems	what was the sale of some retail units in an area over a period?	OLAP, multi-dimensional databases, data warehouse	dynamic delivery of historical data with multiple levels
2000's	data mining	what will happen with the sale on alocation for a period and why?	advanced algorithms, multi-processor computers, massivedata-bases	predictable and proacti-veinformation delivery

With the growth of databases grows a needs for storing a large amounts of data, analyzing and visualizing in order to obtain the necessary data, information and knowledge. Today is increasingly implemented the concept of so-called finding (getting) new data (*Data Mining Data Mining*), used in storing and retrieving data and knowledge, and discovering knowledge in databases, with

a greater emphasis on business and less on the technical aspects. That is the final manifestation of the data storing process ie. the process of finding hidden trends, models, principles and relationships between data. These days it has been perfected to extract data into sub-areas of the text (*Text Mining*), Web (*Web Mining*) or organizing data in time series. In the evolution from business data to business information and knowledge, each new step is built on the previous one. With expansion of the use databases and dynamic new approach to research data (*Data Exploration*), the large amounts of data are leading to hidden data, which are important for getting new information and knowledge discovery, based on existing data and creating a new business value. In this sense was developed a concept of BI (*Business Intelligence*) as an architecture and the collection of integrated operational applications, decision-making support and databases applications, enabling easy access to data in business systems.

As a set of new application, BI has the ability to organize and structure data on business transactions in a manner that enables the analysis useful for decision-making and operational activities in the company. Davenport, De Long and Beers (1998) have distinguished the warehouse of external knowledge, such as stored competitive intelligence, and demographic orstatistical data, from other public data sources and internal storage with informal information, such as transcripts of group discussions, emails or other forms of internal communication. Internal knowledge warehouse has less restrictive or formal structure in order to successfully adjust its subjective knowledge content.

Zack (1999) has classified the warehouses based on the content type, namely: *general knowledge* (eg. published scientific literature) and *specific knowledge* (knowing the local context of the organization). This distinction is very useful because the knowledge re-users should be aware if the knowledge credibility derives from the general or common knowledge, or was it discovered by their collegues. This makes sense in the distribution of global knowledge warehouse along similar lines. Attention should be paid to the role of mediator who needs to develop and maintain the corporate memory of the organization. The authors of content are vital for the successful implementation of knowledge reuse as storage place. There are several methods that enable an individual to apply knowledge being a knowledge user models the task. Here is important to adjust the knowledge content to the requirements and performance of employees. EPSS and Bloom's taxonomy of cognitive, affective and psychomotor skills are good resources that provide learning and support to knowledge workers, who apply their knowledge and optimize its correspondence between needs of users and content that should be applied. The organizational architecture of

KM needs to be designed, developed and implemented in order to facilitate the application of knowledge at the organizational level. Reuse of knowledge is a good tool of management and conservation of valuable content in systems of the organizational memory management. Knowledge support systems can help in the use and reuse of organizational knowledge through particular forms of knowledge warehouses or Internet applications.

4. INNOVATION OF THE KNOWLEDGE PROCESS

The possibility of improving and innovating the knowledge processes in the company assumes a dynamic approach to changes ie. the elaboration of dynamic the knowledge models and integration with business processes. Knowledge is an activator of economic development. The ability to invent and innovate, ie.to create a new knowledge and new ideas, embodied in products, processes and organizations, is the main engine of development. There have always been organizations and institutions dealing with the creation and dissemination of knowledge. However, the knowledge economy offers a lot more possibilities. The point is to increase the speed of the knowledge creation, accumulation and devaluation in relation of actuality and value. This trend, among other things, has reflected through the rapid growth of scientific and technological progress. This has had some consequences, initiating new challenges. Today, a new type of organization follows the new phenomena related to knowledge, namely: communities based on knowledge, ie. network individuals trying to create a new knowledge and put it in circulation.

Many scholars (eg, Drucker 1995) have argued that knowledge was one of the very few sources of sustainable competitive advantage and that the knowledge management application weakens the power of a group, organization, or even at the company level (Davenport and Prusak, 1998). According to Brown and Duguid (1998; 1999) knowledge is transferable entity (such as electric energy, fluids, cargo), which causes the phenomenon of knowledge conceptualization as the flow. Research in these works are based on the current theory, which refers to the knowledge flows, with focus on its dynamics, and supporting the improvement of design processes. A good understanding of the knowledge process, extends the theory, leading to a more comprehensive approach to the process of knowledge innovation. Synthesis of the different approaches to KM

allows extracting four dimensions, analyzed in the most discussions: a) *time*, as a linear and simplified representation of cognitive processes, including: mapping, adoption, codification, storage, use and transformation of knowledge and its elements b) *type*, referring to tacit and explicit knowledge, c) *level*, referring to a variety of social welfare aggregation d) *context*, which refers to finding the meaning, so the knowledge elements would not contain any meaning outside given context.

KM has always been rooted in the individual and his behavior, and the formalization of the area has been directed towards the systems and structures that provided incentive to the production, transfer, use, and re-invention of knowledge in the company. That orientation was largely caused by information technologies, enabling communication one-one, one-all and all-all. Innovation has become a dominating activity, whose sources that vary more than ever. Additional reflections in applying the role and importance of innovation is the increase of the speed at which they arise. There are two main methods that lead to new innovation breakthrough: *first*, through formal research and development outside the Internet connection *offline* (ie, isolated and protected from the usual provision of goods and services), and *second*, through learning via Internet connection - *online*, where individuals can learn and, as a rule, to estimate what they learn, improving their skills for the following activities. That can be very convincing form of knowledge production when it comes to many professions. Meanwhile, the need for innovation becomes larger as innovation itself becomes the only tool for survival and prosperity in a highly competitive and globalized economies. For the purposes of this manuscript, the literature on KM has been summarized in four key concepts: hierarchy of knowledge, information technology, systems based on knowledge, and life cycle of the management knowledge process.

Four major areas of knowledge (SECI) must be continuously improved in the company based on knowledge. Improvements can be achieved through information technology, systems based on knowledge and re-modeling of the management life cycle. A very important step in the process of creating new knowledge is conceptualization of the knowledge hierarchy, information and data (Davenport and Prusak, 1998, Nissen 2000; Von Kroug et al., 2000). Each level of the hierarchy is built on a level that is below it. For example, data are necessary to produce the information, but information include more than just data (eg, data must exist within the context). Similarly, information is necessary to produce knowledge, but knowledge involves more than information itself (eg, it enables action).

When it comes to knowledge processes, the knowledge hierarchy is the basis for placing the information technology at the right place. Modern information technology, used to support knowledge management, is limited primarily to the conventional management system - *Database Management Systems*, *Data Warehouses* and data research techniques *Data Mining*, internal network / business community network (*intranets / extranets*), web portals, focus group process (*Groupware* - by O'Leary, 1998). When separately analyzed, the word 'data' in the context of many 'tools of the knowledge management' (eg, DBMS, DW / DM), the problem is insufficient activity at the level of information, and much less on the level of knowledge. Although Internet network provides ordinary, independent mediator for distributing and linking of multimedia documents, actual *intranet* (internal network) and *extranet* (business community network) applications are directed primarily towards the management and distribution of information, and not towards knowledge in particular. This is the reason for the use of knowledge based systems.

The creation and use of *knowledge-based systems* can make knowledge to be explicit and its use to be direct. Primary KBS technologies include following applications: expert systems and intellectual factors, infrastructure and supporting resources, such as ontology, knowledge bases, activators, algorithms, leaf and logic programming languages and variety of representative formalisms (eg, rules, frames, sheet models , semantic networks). In a greater extent, KBS systems are based on winning, formalization and use of domain knowledge. Previous considerations have an important impact on the knowledge process design and its interaction within the organization.

Conceptually, there are three organizational flows: physical flow, information flow, and knowledge flow. All of them interact dynamically, as time progresses. Knowledge moves in cycles with time. Nissen et al. (2000) discuss the sense of process flow or life cycle, which is associated with the management of knowledge. After a complex review of the literature (eg. Despres and Chauvel, 1999, Gartner Group, 1999; Nissen, 2002), so-called "*merger model*" of knowledge management life-cycle is complete because it consists of six phases: learning, knowledge organization, knowledge formalization, knowledge delivery, knowledge use, and knowledge development. The knowledge processes should interact with the physical and information processes. Infrastructure of information technology can support such interaction. The knowledge processes must be optimized and designed to maintain the dynamics of the whole company. The companies should recognize the importance of mutual interaction, willing to incorporate a mechanism that enables it.

The whole process of knowledge building and rebuilding should be divided into several dense concentrated processes. Each theme design must be in a function of knowledge positioning as the most important company asset. Significant integration of knowledge management and innovation process is viewed as the current progress, until the companies understand the direct link between knowledge management and innovation as a result of the knowledge working process (Davenport et all., 1998). In scientific work that makes more than thirty KM actions, Davenport et al. (1996) note that the practice has "*fundamentally changed the management of projects."* The newly created theory of knowledge creation and management has, in a dynamic sense, very oriented process (see Nonaka, 1994). Ruggles (1998) suggests that the primary goal of the practice should be accessing the knowledge management as a process, because it is fundamentally important for innovation. However, tedious, costly innovation, prone to "*first wave*" (Cypress, 1994), including IT in the process, do not guarantee the performance improvement. Many successful and effective companies experience degradation in the innovation application process (Caron et all., 1994; Hammer & Champy, 1993). Hammer (1990) has vividly explained this practice as "*automation of disorder*."

According to Leavitt (1965) and others (cf. Davenport, 1993; Nissen, 1998), the new IT should be included in the design process it supports. In addition to technology, organizations, people, procedures, activities, and other key factors must be considered. Given that many KM projects involve IT implementation (eg, internal network / business community network - *intranets/extranets*, Web portals, targeted group process - *groupware* - Nissen et all., 2000), innovation process and knowledge management process seem to share some repeating errors. Based on these studies, there is a strong interaction between the work flow and the knowledge flow within organization. According to Oxendine and Nissen (2001), these flows are horizontal and vertical processes. In short, two horizontally oriented graphs are presenting two separate examples of the work process (steps are marked in a particular point of time, location and organization).

A graph on top of the Figure 3.11 presents the first example of this preliminary process (derived in one point of time, location and organization), and graph at bottom presents the second example (derived in another point of time, location and organization). Both horizontal graphs represent the *workflow* of the company. Besides that, it is necessary to present the information flow, as a conceptualization of work processes and the knowledge flow (Nissen 2002). Vertical graph is additional set of processes responsible for the information flow and knowledge flow. Knowledge is not equally distributed within the company,

so the company performances depend on consistency and effectiveness of the various workflows. Related knowledge (eg, procedural process, the best practices, selection of resources and their use) is flowing through time, space and organization. The process of intersecting activities leads the knowledge flow in the opposite direction from the workflow. Indeed, Nissen and Espino (2000) have identified seven vertical processes (eg, training, staff mission, IT support) interacting in a more complex way, which is not a reflection of a simple, linear flow shown in Figure 3.12.

FIGURE 3.11:KNOWLEDGE HIERARCHY
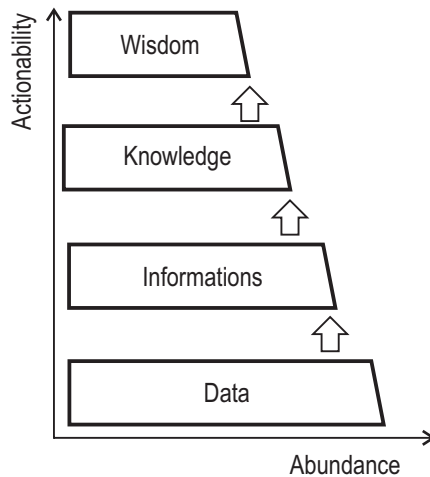
Source: Adapted from Nissen 2001, p. 3.

Knowledge is expertise, experience, know-how, skills and competence. The knowledge processes are synergetic symbiosis of management, organization, business processes and information technology. Traditional organizations have neglected the knowledge processes. Today, many organizations are facing old, inefficient ways of knowledge creation and re-creation, trying to re-conceptualize business processes and knowledge as its main process. Successful outcomes are rare, and that is a fact.

FIGURE 3.12: KEY ELEMENTS OF KNOWLEDGE BASED ENTERPRISE
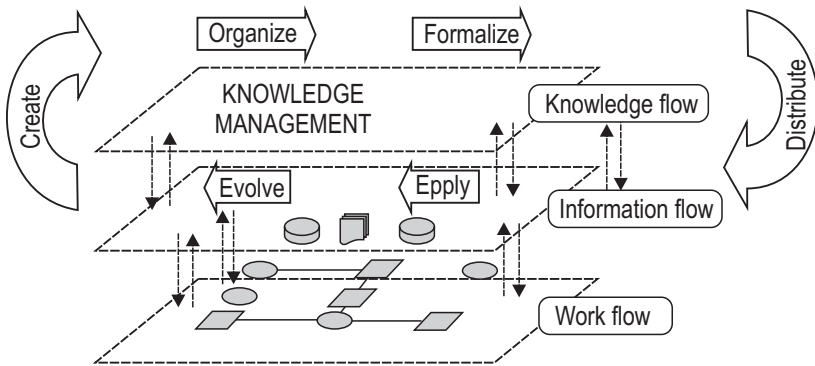
Methodology of knowledge creation is recomended in following steps: analysis of the existing knowledge process, defining the innovation strategy, mapping the individual and organizational knowledge, re-modeling of knowledge process and other processes, and implementing the new knowledge processes. Improving the knowledge management assumes a holistic approach and complex efforts in every organization, more or less. Knowledge is intangible asset. It can be transmitted and distributed throughout the organization. Implementation of methodology that emphasizes dynamism is strongly recomended. Dynamics is the main feature of the knowledge process, especially of those who create a new knowledge and innovation (cognitive thinking). Design of knowledge process and its interaction should be fundamentally based on dynamics. In conclusion, success of the modern enterprise depends on timely effective knowledge flow throughout the organization. Knowledge is not evenly distributed in the enterprise, so the knowledge flow must be timely and effective established by implementing new processes. Several well-known theoretical models of knowledge support the innovation of knowledge processes.

The practical research shows that the innovation of knowledge processes is achieved by trial and error, which proved to be the most effective method. The research described in this paper is upgrading on existing theory and practice of knowledge management, with attempts to extend it in some parts, especially in integration of knowledge flow into coherent processes. Supporting broader understanding of knowledge flows, we want to contribute to the creating of "instrument" which would be used in the field of knowledge process innovation

across the organization. The result is improvement of the current practice of process innovation. This model can be used, and vice versa, and it can be seen as a ground for designing of information systems and business processes. Differentiating the knowledge flows, information flows, and the complementary flows in the company, we have identified the important dynamic, which should be a framework for the formulation of a methodology for the quality knowledge management.

Box 20 - Innovation processes and knowledge processes

There is not much research to date that empirically links innovation processes to knowledge processes. Knowledge creation is one of the knowledge processes that may support innovation processes. Knowledge creation is perceived as one of the major assets of innovative organizations, and innovative organizations are defined by knowledge creation (Merx-Chermin and Nijhof 2005). Jashapara (2004) combines the management of innovation processes with knowledge processes in a conceptual model (see Figure B25).

FIGURE B25: EPISODES IN THE INNOVATION PROCESS
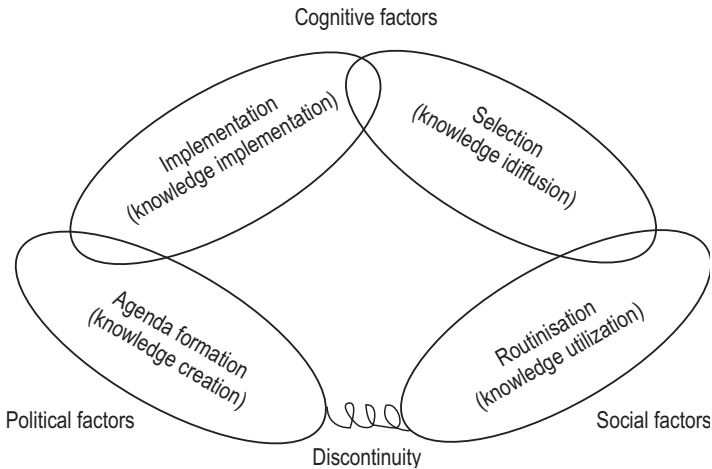
Jashapara distinguishes the following innovation processes: agenda formation, implementation, selection and routinization and links these innovation processes respectively with knowledge creation, knowledge implementation, knowledge diffusion and knowledge utilization. He does not

elaborate on the interaction of these innovation processes and knowledge processes but argues that tacit knowledge is more important in the first stage of knowledge creation and agenda formation. Explicit knowledge is said to be more useful in the final stages of knowledge utilization and routinization. This may be expained by the fact that the final stage parallels the codification strategy where knowledge codification, storage and retrieval mechanisms are developed (Jashapara 2004). Others argue that tacit knowledge is more important for innovation than explicit knowledge (Senker 1993; Swan, Newell et al. 1999). According to Senker (1993) the complexity of systems is the most common reason for the importance of tacit knowledge for innovation.

The management of tacit knowledge requires processes of personal interaction. Therefore socialization strategies (Nonaka and Takeuchi 1995) and personalization strategies (Hansen, Nohria et al. 1999) should be used to optimize knowledge processes and consequently innovation processes.

*Source*: Verburg &Hoving 2007, adapted from Jashapara, 2004.

4.1 The Knowledge Flow and its Dynamics

One of the most popular approaches to *knowledge flows* is by Nonaka (1994) in terms of organizational learning. Two dimensions of knowledge have been considered: epistemological and ontological. Epistemological dimension reflects the binary contrast between explicit and tacit knowledge. Explicit knowledge can be formulated through artifacts, such as books, letters, manuals, standard operation procedures and instructions, whereas tacit knowledge contains more understanding and expertise in human mind. Ontological dimension reflects the knowledge that is shared with others in a group or larger aggregation of people within the organization. Although this aggregation of organizational units seems arbitrary, in the context of the company, it can be clearly applied in small teams, workgroups, departments, business units, companies, business associations and networks. As shown in Figure 3.13, Nonaka uses interaction between these dimensions as the principal tool for describing the knowledge flow. This flow has been roughly shown in four steps. First, Nonaka argues that new knowledge is created only by individuals in the organization and that it is, by nature, necessarily tacit knowledge. In theory, the first knowledge flow is going through a process called socialization, pointing to the team members who share the experience and observation; indi-vidual should participates in communities and practice. The course of socialization is represented as a vector 1 that

corresponds to tacit know-ledge (ie, includes the epistemological dimension), ranging from the individual to a group level (ie, includes the ontological dimension - Nissen, 2002). Another knowledge flow (vector 2) on theory basis, occurs through a process called externalization and that means the use of metaphors in dialogue. It leads to the removal of tacit knowledge and next formalization into concrete and explicit. The third flow of know-ledge (vector 3) on theory basis, occurs through a process called combination. It points to the coordination of different groups within organization, along with documentation of existing knowledge, in order to combine new internal team concepts with other, explicit knowledge within organization. The fourth flow of knowledge (vector 4) on the basis of theory, occurs through a process called internalization. Internalization points to a various members of the organization, including the above combined knowledge, often through trial and error - and vice versa, transferring this knowledge in the form of tacit knowledge at the organizational level.

FIGURE 3.13: NONAKA KNOWLEDGE FLOW THEORY
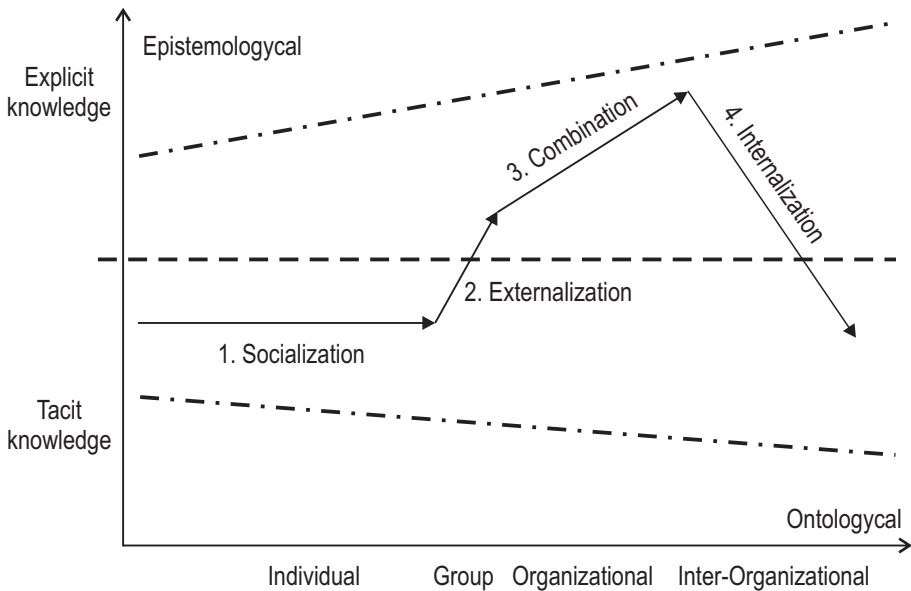
Source: Asapted from Nonaka,1994; Nissen, 2001.

The creation process of new knowledge requires an understanding of the knowledge flow. This section is built on the aforesaid understanding of Nonaka and Nissen's models, related to dynamics of the knowledge flow. This section can help better description and explanation of moving the knowledge through the enterprise. The first step to upgrading the existing theories of the flow of knowledge is the extend of Nonaka's dimensional framework, including the third dimension, the knowledge management lifecycle.

FIGURE 3.14: EXTENDED MODEL WITH KNOWLEDGE FLOWS
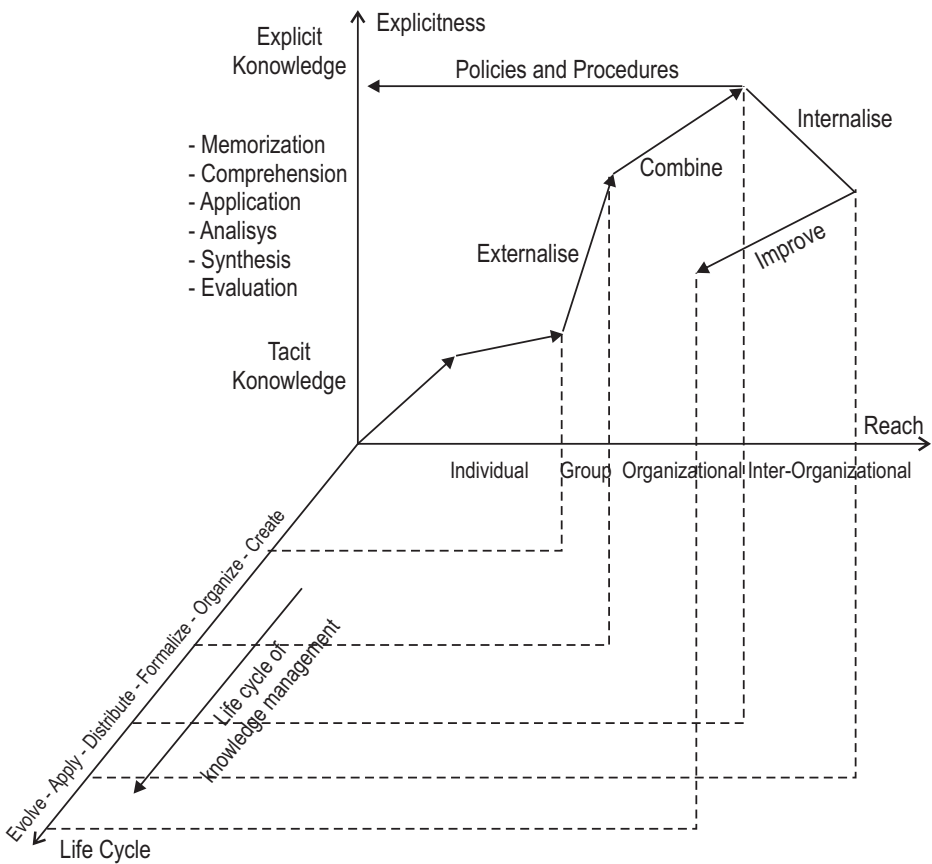
Source: Nissen 2001, p. 19.

Nissen has operationalized the form using the life cycle stages of the *merger model* (Nissen, 2002). Furthermore, because the concept flow is inherently dynamic, Nissen extends this framework by adding time as the key fourth dimension. This increased dimensionality extends Nonaka's two-dimensional framework and provides the basis for more complex models. More complex model can increase our ability to describe and exposure in terms of understanding the knowledge flow phenomenon.

In Figure 3.14 we see several meaningful vectors of the knowledge flow and classification of the different dynamic forms of knowledge that moves through the company. For example, simple rectilinear flow, marked as "rules and procedures", reflects how the most companies inform and perform the training of employees, using these rules and procedures. The explicit documents and guidelines, used by individuals within the organization, are expected to be remembered, used and had in mind. Another example, the cyclical knowledge flow, described by joint KM life cycle model, as shown in the figure 3.14, reflects the complex dynamics of a simple, linear antipode. Mentioned flow represents the cycle of knowledge creation, knowledge transmission and knowledge development within the working group.

Furthermore, Nonaka's dynamic theory of knowledge flow can be described in the space by curvilinear vector sequences that correspond to individual processes, called "create", "socialize", "externalize", "combine" and "internalize". For this purpose, the model contains what Nonaka has proposed, reflecting the complex dynamic of the knowledge flows along with the life cycle. Moreover, analysis of this area indicates the inclusion of more meaningful vector, which is not a part of Nonaka's theory, but a key element of empirically derived model of *mergermodel* (ie, the key of skills evolution). It is clear that many other trends and forms could be displayed this way. Nissen has included the time dimension in the current model, because the static views can hardly visualize more than three dimensions.