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Chapter 2

The Emergence of Knowledge Management

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Abstract

The purpose of this chapter is to show that knowledge management emerged as a necessity in the post-industrial society and the new knowledge economy. Instead of starting from defining knowledge management and describing its functions to create a prescriptive framework, the chapter begins with the broad picture of the changes in the structure of economy and in its critical assets. These changes produced a new type of economy where scarcity of tangible resources has been replaced by the affluence of intangible resources, and the economic theories of resource optimization and profit maximization have been aligned to knowledge creation and business sustainability. The engine of knowledge economy is the knowledge-based organization, where the pressure of efficiency and productivity should be relaxed. Instead, there is a need to develop new metrics able to measure the quality of knowledge and to evaluate the contribution of organizational learning to the firm's performance. Finally, the chapter presents the new attributes of knowledge workers and knowledge processes. Knowledge creation, acquisition, storing and retrieving, sharing and distribution, transformation and use become the components of knowledge management. Since knowledge and its functions constitute strategic resources, knowledge management bridges the gap between operational management and strategic management.

2.1 The Knowledge Economy

2.1.1 *The Fourth Discontinuity*

In his seminal book *The age of discontinuity: Guidelines to our changing society* published in 1969, Peter Drucker reveals some major changes in four areas of the world economy with great impacts on the whole society. He calls these major changes *discontinuities* which “while still below the visible horizon, are already changing structure and meaning of economy, polity, and society” (Drucker 2008, p. xxvii). He considers that these discontinuities, aggregated on their main dimensions, result in a “recent future” since they show some accomplished facts and some challenges to come at the same time. They may play the role of an “early-warning system” for decision makers in all areas of the modern society. The major discontinuities identified by Peter Drucker are in the following areas:

- The emergence of new technologies, able to generate new industries and businesses.
- The transition from the “international economy” to the “world economy” which leads finally to the creation of the one global market.
- The political matrix of social and economic life, which is changing fast and leads to a new sociopolitical reality.
- The emergence of a knowledge economy. “Knowledge, during the last few decades, has become the central capital, the cost center, and the crucial resource of the economy. This changes labor forces and work, teaching and learning, and the meaning of knowledge and its politics” (Drucker 2008, p. xxix).

Drucker recognizes our difficulties in forecasting the future since human mind has always been focused on continuity, which means to extrapolate

today's reality into the immediate future. By evaluating the past developments in industry and economy, experts can measure results and anticipate some trends based on them. But they cannot anticipate discontinuities and predict crises into a future that refuses to align to the living present.

Inspired by the Princeton's economist Fritz Machlup who coined the term "knowledge industries" in his book *Production and distribution of knowledge in the United States* (1962), Drucker coined the concept of "knowledge economy" and used it as the title of chapter 12 in his book. Using statistical data, he shows how knowledge, knowledge work, and knowledge workers became significant phenomena in the new economies of developed countries like United States. As Drucker (2008, p. 264) remarks, statistics "do not reveal the important thing. What matters is that knowledge has become the central 'factor of production' in an advanced, developed economy". "Knowledge" is somehow different than "knowledge" used by intellectuals since it is linked to action. While the intellectuals' knowledge is theoretical and used in books and scientific journals, organizational knowledge is actionable and used by knowledge workers in their practice. From this point of view, Drucker considers that the most important step toward a knowledge economy has been done by Frederick W. Taylor in his pioneering scientific management. By introducing engineering methods in organizing and measuring the efficiency of industrial work, he was able to increase almost exponentially work productivity. That was possible not by working harder, but by working smarter. Thus "The key to productivity was knowledge, not sweat" (Drucker 2008, p. 271).

In his visionary book *The coming of post-industrial society* (1973) Daniel Bell dedicated a full chapter to the knowledge dimensions and the role of new technologies in structuring the new class of post-industrial society. Being inspired by the same book written by Fritz Machlup, Bell defines knowledge as "a set of organized statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form" (Bell 1999, p. 175). The rationalistic perspective adopted by

Bell and his social setting for knowledge transfer and use in the post-industrial society is obvious. In demonstrating the increasing role played by knowledge in the new society, Bell focused his attention on scientific knowledge published in books and journals, and less on knowledge embedded in products and services. Although there is a different perspective in designing the future of the “information age” than that used by Drucker, the message reveals the same significance: the coming of a new economy in which the dominant capital is not land, labor or money anymore. It is knowledge.

2.1.2 Key Features of the Knowledge Economy

Drucker’s vision of the coming knowledge economy is now a reality. Knowledge became the driving force of the knowledge economy, and the knowledge economy became the engine of the global economy growth. Powell and Snellman (2004, p.199) define knowledge economy as “production and services based on knowledge intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence”. Thus, it is an economy in which knowledge is created, acquired, transformed, transferred, disseminated and used effectively to enhance economic development. One key feature of the knowledge economy is a greater reliance on intangible resources and on intellectual competences of using them, than on physical resources. A car today represents less a metal manufactured product and more a smart machine that incorporates data, information, knowledge and a lot of intelligence. Same remark can be made of many other products that changed completely our way of thinking in producing and using them.

The knowledge economy is not about scarcity of resources but about their affluence. All tangible resources that contribute to achieving a competitive advantage for a firm are scarce and using them in the production process should be done efficiently. Intangible resources like data,

information and knowledge are not scarce anymore. On the contrary, in many domains there is an overflow of them. From scarcity of natural resources, we reach a stage of abundance of intangible resources which have the property of being non-rival assets. They can be deployed at the same time in multiple uses, and they don't decrease by dissemination. The real problem now is not the quantity of data, information and knowledge, but the capacity of analyzing and interpreting them. Even with the new technology of Big Data and the intelligent programs of data mining, the human capacity of processing the meanings and making decisions in conditions of uncertainty is still very limited (Davenport 2005; North and Gueldenberg 2011; Spender 2014). Thus, the knowledge economy is about abundance of intangible resources and limited human capacity of processing them.

The ownership of knowledge assets is debatable since knowledge is created in the minds of people and only a part of it can be aggregated and transformed into organizational knowledge which can be owned and controlled by the firm. That changes completely the way in which knowledge assets can be managed and used in the production process of goods and services (Dalkir 2005; Jashapara 2011; Nonaka and Takeuchi 1995). Tacit knowledge which integrates employees' experience can be lost when they retire or just leave the firm for some other jobs. Also, controlling knowledge assets cannot be done in the same way as for tangible resources since knowledge creation, sharing and dissemination depend strongly on individual capacity of performing these activities and on willingness of employees of doing them. Thus, in the knowledge intensive organizations, the rewarding systems switch from external to internal stimulating factors making use of phenomena which can be described by the new multi-field theory of knowledge and the new knowledge dynamics we have presented in Chapter 1. Motivating people is a complex process based especially on the transformation of the emotional knowledge into rational knowledge and spiritual knowledge which is generally ignored in the industrial management based on rationalistic decision making and economic efficiency (Zohar and Marshall 2004).

In the industrial economy, growth can be obtained by linear accumulation of tangible assets and their combination in the production process. In the knowledge economy, linear accumulation is not possible since intangible assets are nonlinear and they should be integrated, which is a totally different approach. Nonlinearity (Bratianu 2009) implies new metrics of evaluation and reporting of intellectual capital. In the knowledge economy we deal with different types of intangibles which request different metrics and scales leading frequently to the incommensurability problem (Spender 2014; see also Chapter 8 for details). Even the well-known scales of space and time change as a result of the information technology. For the global markets, the geography of production plants is losing its importance, and time is shrinking for the knowledge cycles and innovation processes. Speed of change and innovation strategies are the new characteristics of business models. “Though optimization, as a process, is equally important in the knowledge economy, it alone cannot create or maximize value. The only way to create value in the knowledge economy is by adopting innovation as the core business process. An organization’s ability to create value depends on its innovation process, its intellectual resources, and the creativity of its workforce – its intellectual assets” (Al-Ali 2003; p.8).

The knowledge economy became possible as a result of structuring a new social class of people able to contribute with their creativity to the new wealth of society. Richard Florida (2002; p.68) demonstrates that the knowledge economy is intrinsically related to the development of *the creative class* which “consists of people who add economic value through their creativity. It thus includes a great many knowledge workers, symbolic analysts and professional and technical workers, but emphasizes their true role in the economy”. That may constitute also an argument against those authors who equate knowledge economy with the powerful new information technology, since the creative class shows the crucial role played by the human capital in shaping that economy.

Information technology does not create knowledge but constitutes the basic support of processing data and information at amazing speed, and of communicating them in complex networks. Also, the new

information platforms enable knowledge seeking and knowledge sharing within the boundaries of firms or across of them. Information technology enables creating open innovation systems and virtual communities of practice (O'Dell and Hubert 2011). However, the efficiency of using such information technology depends on the managerial capacity of each firm and on performing necessary structural changes to accommodate the requirements of that technology. Also, to use efficiently new information technologies and their applications, people should be trained and helped in understanding their logic and smart operation. As Powell and Snellman (2004; p.208) emphasize, "the long-expected gains in productivity from investments in information technology are not fully realized until complementary institutional arrangements are developed".

In the knowledge economy, new interactions between social institutions can be generated for stimulating knowledge production, transfer and application. For instance, Leydesdorff (2006) analyzes the importance of developing a triple helix of university-industry-government relations. The role of the government is to create a stimulating legislation framework for developing such new structures and clusters of science and technology, where universities contribute to knowledge production and transfer toward industry, where knowledge is used for innovation in business and in producing new goods and services. "In other words, university-industry-government relations develop in terms of institutional arrangements that recombine three functions of the socio-economic system: (1) wealth generation and retention, (2) novelty production, and (3) control at the interfaces of these sub-dynamics" (Leydesdorff 2006: p. 48).

The knowledge economy created a new market able to deal with knowledge and knowledge embedded in goods and services. Knowledge is not only a resource but also a product in itself that can be subject of a market transaction. People are knowledge seekers because they have to solve problems in conditions of uncertainty and incompleteness information. Thus, they are potential buyers of information and knowledge needed to solve new problems or to create new goods and services. As Davenport and Prusak (2000; p.25) remark, "Like markets for goods and

services, the knowledge market has buyers and sellers who negotiate to reach a mutually satisfactory price for the goods exchanged. It has brokers who bring buyers and sellers together and even entrepreneurs who use their market knowledge to create internal power bases”.

2.2 The Knowledge Organization

2.2.1 The Economic Theory of the Firm

The emergence of *Knowledge Management* cannot be understood and explained without a deep understanding of the nature and functioning of the firm. As Spender (2015a; p.4) emphasizes, “it is crucial to see KM cannot and does not embrace the entirety of human knowing. It always hinges on a ‘theory of the firm’, a boundary concept that separates organizational knowing from broader epistemological matters”. Many economists took it for granted that firms came into existence as a possible answer to the complexity of the new enterprises created by the industrial revolution and made no effort to explain their nature and purpose. In a seminal paper on this topic, Coase (1937) demonstrated that it is necessary to explain the concept of *the firm* and to show its difference from a real world firm. Also, he considered necessary to build a theory able to reveal the determinants of the firm growth and its behavior with respect to the market. He analyzed the main approach developed by economists, based on the price mechanism, and found it inconsistent with the economical and managerial phenomena that occur within the firm. He shows that if the price mechanism is considered the fundamental principle based on which all decisions should be made within an economic system, then we cannot have a rational explanation for resource allocations within a firm and especially for the motivation of an entrepreneur in coordinating ac-

tivities in a real world firm. As a consequence, Coase wanted to bridge the gap between the economic theory of resource allocation based on the price mechanism at the macroeconomic level, and the theory of resource allocation within a firm where decisions are made by the entrepreneur. In his view, “A firm, therefore, consists of the system of relationships which comes into existence when the direction of resources is dependent on an entrepreneur” (Coase 1937; p. 393). Based on that assumption, Coase goes on analyzing the economical factors that determine the size of the firm, especially the costs associated with increasing complexity of managerial decision making under uncertainty, a subject introduced in that analysis by Knight (1921). Uncertainty means that knowledge about the future is incomplete and that events do not have a deterministic behavior. In these conditions, managerial decisions involve always some risks and a bonded rationality approach, as demonstrated by Simon (1976).

Edith Penrose, in her landmark book *The theory of the growth of the firm*, whose first edition has been published in 1959, explains that “The ‘theory of the firm’ – as it is called in the literature – was constructed for the purpose of assisting in the theoretical investigation of one of the central problems of economic analysis – the way in which prices and the allocation of resources among different uses are determined” (Penrose 2013; p. 11). She found that previous attempts to formulate a theory of the firm were insufficient for the complexity of processes within the firm and powerless in revealing the forces able to contribute to the internal growth of the firm. In fact, a theory of the firm is a conceptual model able to represent at a certain abstraction level the main processes within a firm. This should be done such that the conclusions of any analysis based on the model to be validated then by the concrete facts within real world organizations. Penrose identifies, as relevant aspects of a firm, its administration and all resources used as inputs in the production process of goods and services. “Thus, a firm is more than an administrative unit; it is also a collection of productive resources the disposal of which between different uses and over time is determined by administrative decisions” (Penrose 2013; p.24). An interesting remark she makes is on the potential services that resources may have. That distinction between resources and

their potential services leads to the different ways firms are deploying their resources, and as a consequence to the creation of the competitive advantage on the market.

Since this book is about strategic thinking and knowledge strategies, it is worth to see how Penrose made a clear distinction between business opportunities and their perception by decision makers: “Although the ‘objective’ productive opportunity of a firm is limited by what the firm is able to accomplish, the ‘subjective’ productive opportunity is a question of what it thinks it can accomplish. ‘Expectations’ and not ‘objective facts’ are the immediate determinants of a firm’s behavior, although there may be a relationship between expectations and ‘facts’ – indeed there must be if action is to be successful” (Penrose 2013; p.41).

In her analysis about the role of resources in growth of the firm, Penrose shows the importance of knowledge in its explicit and tacit forms, about 30 years before the Nonaka’s analysis. She makes the difference between explicit knowledge which is “objective” and can be communicated, and the other form which is “subjective” and integrates the personal experience. The objective knowledge is about things and reflects the “know that” or “know about” while the other form of knowledge reflects “know how” of doing something, as demonstrated later by Ryle (1949). Experience is a powerful source of knowledge since it “produces increased knowledge about things and contributes to ‘objective’ knowledge in so far as its results can be transmitted to others. But experience itself can never be transmitted; it produces a change – frequently a subtle change – in individuals and cannot be separated from them” (Penrose 2013, p.53). This idea is very important in understanding her theory of the firm and will be developed later by other authors in their theories about knowledge-based firms.

Penrose’s analysis goes beyond the boundary of the firm and considers that knowledge from the external business environment could be useful: “Clearly external changes may also become part of a firm’s ‘stock of knowledge’ and consequently they may change the significance of resources to the firm. Knowledge of markets, of technology being devel-

oped by other firms, and of the tastes and attitudes of consumers, are of particular importance” (Penrose 2013, p.79).

Replacing the economic perspective with a sociological one, Simon (1991, p.3) defines an organization in terms of roles played by its members: “organizations are best viewed as systems of interrelated roles, and that is the way I have been viewing them here”. He completes that definition by emphasizing that roles are not prescribed behaviors but a system of prescribed decision premises. “Roles tell organization members how to reason about the problems and decisions that face them: where to look for appropriate and legitimate informational premises and goal (evaluative) premises, and what techniques to use in processing these premises” (Simon 1991; p.3).

The theory of the firm is essentially a modeling approach to extract the main variables and the correlations they create from the real world firms and to construct an abstract view of that reality. Economists were interested mostly in the ownership and control of tangible resources for increasing shareholders’ profit through their efficient allocation and use. However, as Spender critically analyzes, none of those theories are “entirely clear what the firms envisioned are supposed to be doing, where their boundaries lie, what goals they pursue, or how they might be analyzed or evaluated – against maximizing profit, serving the community, optimizing cost and benefit allocation between stockholders, seeking sustained competitive advantage, or simply surviving?” (Spender 2015b; p.57). These were some of Coase’s (1937) “killer questions” and in Spender’s view they are still without adequate answers. Spender rejects the reductionist approach that a firm is a bundle of economic resources, or political relationships. For him, a firm represents a complex socio-economic patterns emerged as “context-contingent constructed responses to the uncertainties that cause social anxiety” (Spender 2015b; p.58).

Firms exist as a consequence of some entrepreneurs who aggregated some strategic inputs for value creation. That means to go beyond data computation and rationalistic decision making and reach the complexity of human nature. Managers are not limited in their problem solving to the rational methods and objective facts, and are capable of using

as well their non-rational experience, intuition and imagination in decision making. Judgment would enlarge their operational field and imagination will help them in dealing with absence of knowledge. Spender's theory of managed firm introduces Simon's concept of bounded rationality and Knight's uncertainty as main constraints in managerial decision making and reveals the fundamental role of *knowledge absence* in that process. "My thesis is that value is created as a manager – an entrepreneur, business leader or strategist – uses their imagination to reach into a confronted knowledge-absence, thereby projecting their judgment into the lived world and thereby agentically transforming it" (Spender 2015b; p.59). Thus, the theory of the firm should incorporate this driving force of searching for practical ways of reducing knowledge-absence caused by knowledge incompleteness, indeterminacy and incommensurability (Spender 2014). Emergence of knowledge management appears now not only as a means of deploying efficiently the existing knowledge resources but also as strategizing for decreasing knowledge-absence and minimizing the risks associated with it in decision making. "Knowledge is about our intentional exploration of our lived context. It is not the impress of reality on our minds" (Spender 2015b; p.63). Knowledge embraced both the objective and subjective perspectives and the etic and emic analysis of the firm demonstrates that knowledge cannot be reduced to an economical asset since it denies the scarcity assumption of tangible resources (Kahneman 2011; Nonaka and Takeuchi 1995; Spender 2015a; Zohar and Maeshall 2004). Managers should go beyond the rationalist approach learned in business schools and use their experience to cope with Knight's uncertainty and Simon's bounded rationality in strategizing for the future and reducing the pressure of knowledge-absence.

2.2.2 The Knowledge-based Theory of the Firm

We have already showed that theories of the firm are conceptual models of real world firms and business enterprises which aim at explaining and

predicting their behavior. Economic theories as previously discussed are concerned mainly with the firm behavior in external markets. Changing the perspective, organizational theory of the firm “analyzes the internal structure of the firm and the relationship between its constituent units and departments” (Grant 1996, p.109).

The knowledge-based theory of the firm is an organizational theory which focuses on the knowledge dynamics within the firm (Grant 1996; 1997; Nickerson and Zenger, 2004; Nonaka 1994; Nonaka and Takeuchi 1995; Spender 1996; Sveiby 2001; Tsoukas 1996). According to Grant (1997, p.451), “the theory explains the rationale for the firm, the delineation of its boundaries, the nature of organizational capability, the distribution of decision-making authority and the determinants of strategic alliances”. The key assumptions of Grant’s theory are the following:

- Knowledge is the most important productive resource within a strategic perspective.
- Explicit and tacit knowledge differ in their transferability dimension. Explicit knowledge can be transferred by using a natural or symbolic language while tacit knowledge is not amenable to transfer.
- Individuals are primary agents of knowledge creation.
- Most knowledge is subject to economies of scale.

Based on these assumptions the firm is conceived as an institution able to resolve the dilemma between knowledge specialization, necessary in production, and knowledge integration through some specific mechanisms like transfer, direction, sequencing and routine. According to this logic, the principal management challenge is “establishing the mechanisms by which cooperating individuals can coordinate their activity in order to integrate their knowledge into productive activity” (Grant 1997; p.452). Thus, managers become organizational integrators (Bratianu 2013).

Since the first assumption establishes that knowledge is the most important productive resource of the firm, the knowledge-based theory may be considered an outgrowth of the resource based view theory of the firm (Barney 1991; Barney and Clark 2007). The resource based theo-

ry conceives the firm as a bundle of specific resources and capabilities and the management as a process of deploying them efficiently and effectively in achieving the firm's objectives. Introducing the strategic dimension in the managerial equation, Teece et al. (1997, p.516) define *dynamic capabilities* as the main driving force for achieving a competitive advantage on the market: "We define dynamic capabilities as the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities thus reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions". These capabilities should not be understood in terms of balance sheets items but as managerial capacities of optimizing the allocation of resources and stimulating innovation. Since dynamic capabilities are essentially emergent functional attributes of a certain firm they cannot be replicated by competitors even if their logic can be observed by them (Teece 2009). Eisenhardt and Martin (2000, p. 1107) give a new formulation to the above definition of dynamic capabilities from a more concrete perspective. They define dynamic capabilities as: "The firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configuration as markets emerge, collide, split, evolve, and die".

The knowledge-based theory of the firm conceived by Grant (1996, 1997) identifies the following properties of *knowledge* which is the kernel of that theory: transferability, capacity for aggregation, appropriability, and specialization in knowledge acquisition. Transferability constitutes the main property of explicit knowledge and reveals the difference between explicit and tacit knowledge. Aggregation comes as property of accumulation of knowledge as any other firm's resources. However, Grant demonstrates here a linear logic of aggregation by addition, which typically applies to tangible resources but, as we have argued, does not apply to intangibles properly. For knowledge, it is better to speak of *integration* and not linear aggregation. Thus, *integration* of knowledge at individual

and organizational levels is its fundamental property, and *organizational integrators* make use of that property in performing knowledge management tasks (Bratianu 2013; 2015a). In the knowledge-based theory of the firm, the whole organization is actually considered a knowledge-integrating institution, which has two main consequences: a hierarchical structure of the organization, and the distribution of decision making authority in the firm. Here, an important issue is the relationship between ownership and decision rights. Unlike tangible assets for which there is a full ownership and control by shareholders, knowledge is created and owned by people and only when a part of it transforms into organizational knowledge through mechanisms of transfer and integration, we can speak about a partial and fuzzy ownership of it. Finally, the property of appropriability refers, in Grant's view, to "the ability of the owner of a resource to receive a return equal to the value created by that resource" (Grant 1996, p.111). Since human capacity of storing and processing data, information and knowledge is limited, enhancing efficiency in knowledge production and use requests specialization in knowledge acquisition and processing. That is related to the fundamental assumption of the theory that knowledge represents the critical input in the production process of value creation.

A fundamental issue in the knowledge-based theory of the firm is how to define *the boundaries* of the firm (Grant 1996; Kodama 2011; Nickerson and Zenger 2004; Spender 1996, 2015b). The theory considers the intangible boundaries of the firm, which represent the span of control of its management upon the firm's resources and capabilities. This is important especially for knowledge and knowledge integration and utilization. The authors make usual reference to the vertical and horizontal boundaries with respect to other firms with which there are collaboration relationships. Knowledge boundaries are related to the boundaries defined for tangible assets, but not entirely, although "Efficient knowledge utilization requires congruence between the knowledge domain of the firm and its product domain" (Grant 1996, p. 120). An interesting analysis of knowledge boundaries and their use in creating a sustainable competitive advantage of the Japanese companies is presented by Mitsuru Koda-

ma in his well-documented book *Knowledge integration dynamics* (2011). In Kodama's view, "Japanese companies operating in specific high-tech sectors are globally competitive because they are building their own *knowledge integration models*" (Kodama 2011; p.37. Italics in original). These models involve the integration of internal fields of knowledge with those outside the boundaries of the firm. These fields of knowledge are generated and supported by internal and external structures (Sveiby 1997; 2001). Japanese firms excel in both vertical and horizontal knowledge integration, by following their fundamental search for harmony. We may say that they developed a successful *boundary management*. For a knowledge-based organization "Boundary management, merging, downsizing outsourcing, acquiring and so forth, in addition to changing the firm's market engagements, can precipitate energizing interpretative flexibility" (Spender 1996; p.59).

2.2.3 The Learning Organization

Analyzing the emergence and evolution of the knowledge organization David Bennet and Alex Bennet (2003; p. 14) consider that, thinking strategically, "A knowledge organization must, of necessity, become a learning organization so that the entire firm will learn while it works and be able to adapt quickly to market changes and other environmental perturbations". The *learning organization* is a metaphorical construct since learning is a human process and knowledge is generated as a result of learning at the individual level. It is related to *organizational learning* and *organizational knowledge dynamics* (Argote 2013; Argyris 1999; Bratianu 2015a; Garratt 2001; Nonaka and Takeuchi 1995; Örtenblad 2011; Senge 1999; Wellman 2009).

Organizational learning can be defined as a learning process through social interactions at group and organization levels. Through organizational learning "whole organizations or their components adapt to

changing environments by generating and selectively adopting organizational routines” (Argyris 1999; p.8). Organizational learning is a generative process able to increase the level of knowledge in a certain social structure and as a consequence to solve a problem or to adapt to a changing environment. Organizational learning has been described by a knowledge spiral generation along the ontological dimension of a given organization by Nonaka and Takeuchi (1995), from individuals to groups and the whole organization. The spiral is evolving as knowledge is converted through the four major processes of socialization, externalization, combination, and internalization which compose the SECI dynamics model.

From a different perspective, Crossan et al. (1999) explain organizational learning as an up-ward process going through the four stages: *intuiting*, *interpreting*, *integrating*, and *institutionalizing*. *Intuiting* operates at individual level as a solving problem mechanism based on personal experience. Individual experience is examined by the unconscious zone of the brain to find out a solution to a new and rather complex problem for which little information and knowledge is available. The result of that process is called *intuition* (Gladwell 2005; Kahneman 2011; Klein 2004). The next stage of knowledge building up is *interpreting*. It operates at the interface between individual and group levels when intuition is shared within a group context. It is basically a social process when people contribute to interpreting the individual inputs and integrating them into a shared understanding. That transforms individual knowledge into a group knowledge based on collective *sense-making*. Group knowledge can also be enhanced by absorbing knowledge from its social environment. That leads us to *integrating* knowledge and moving upward to the level of the organization. Integrated knowledge triggers decision making and action. Finally, the *institutionalizing* stage operates at the organization level through establishing new routines. Thus, organizational learning produces outcomes belonging to the whole organization. Although these processes have been presented as sequences in a linear logic, they have a complex and nonlinear structure.

A good example of organizational learning is *kaizen* or continuous improvement practiced by Japanese companies. For instance, Toyota

company developed a very successful process of continuous improvement which has been considered as a model for many other companies in the world. "Toyota works at a target condition in small, rapid steps, with learning and adjustments occurring along the way. This is the equivalent of placing one foot in front of the other, one step at a time, and always adjusting to the present situation as necessary, and is quite different than working through the predefined steps of a plan or action-item list" (Rother 2010; p. 131).

The learning organization is a result of our metaphorical thinking. As Stewart (2001; p.147) emphasizes, "The concept of the learning organization has metaphorical status because it is embedded in the multiple narratives of organizations in all their complexity, though it becomes taken for granted, reified, and treated as though it always existed". The concept of the learning organization has been pioneered successfully by Peter Senge in his seminal book *The fifth disciplines: The art & practice of the learning organization*, published first time in 1990. The book became immediately a source of inspiration for many academics and practitioners to expand research and applications of this new concept related to knowledge-based organization and systems thinking. Senge considers that *the learning organization* is a social invention based on five disciplines: personal mastery, mental models, shared vision, team learning, and systems thinking. In his view, a discipline is "a body of theory and technique that must be studied and mastered to be put into practice. A discipline is a developmental path for acquiring certain skills or competencies" (Senge 1999; pp.10-11). Personal mastery is defined as a continuous effort of learning and increasing the knowledge potential. Mental models are cognitive structures for understanding our external environment and making decisions. They are formed in schools and improved by individual experience. Shared vision means to focus on the team and organization future and to harmonize personal interests with those of organization. Shared vision is the main enabler of strategies design. Team learning means encouraging organizational learning and creating a common platform for knowledge generation. Finally, system thinking integrates the all four disciplines and creates the necessary conditions for developing a learning

organization. For Senge (1999; p.13), “A learning organization is a place where people are continually discovering how they create their reality. And how they can change it”. A learning organization should be able to go beyond the goal of surviving or adapting to a changeable environment. It should be able to achieve a competitive advantage by generating knowledge and influencing its environment. The most important message Peter Senge disseminates through his book is that we should make a shift of our mindset from focusing on single events and parts of the problem toward seeing the whole, and understanding its behavior in harmony with the external environment.

2.3 Knowledge Management

2.3.1 Knowledge Workers

Peter F. Drucker is credited with the first significant analysis of the *knowledge workers* and their *productivity* in his landmark book *The age of discontinuity*, published in 1969 and then re-published several times. With the emergence of knowledge economy, *knowledge work* and *knowledge workers* become new determinants of the social value creation. Since any worker in any kind of activity is using his knowledge base which integrates his experience and learning, it is difficult to define a clear cut between industrial workers and knowledge workers. The work boundary is rather fuzzy, but as we move further from it is clear that knowledge work means processing data, information and knowledge in an overwhelming way by comparison with physical activity characteristic to industrial work. Although Drucker formulated no definition of knowledge workers, he identified the most important feature of their work and the new type of management necessary for that. A good working definition is offered by Davenport (2005; p.10): “Knowledge workers have high degree of exper-

tise, education, or experience, and the primary purpose of their jobs involves the creation, distribution, or application of knowledge”.

The business of knowledge workers is thinking, creation, sharing, transfer, transformation and application of knowledge. In the knowledge economy, the activity domains where knowledge work predominates are the following: science, engineering, architecture, medicine, management, business, law, community and social services, education and training, library information, arts, design, entertainment, and media. In management, knowledge workers make decisions and find solutions to non-routine problems, and develop strategies for achieving sustainable competitive advantage on the market. In engineering, knowledge workers conceive new systems and technologies or use intelligent technologies in solving economic and social problems. In science, scientists have always been knowledge workers. What is new in the knowledge economy are the large opening of science toward society and the development of applications for people which increases the contribution of applied science and research within the whole domain of science. Following Drucker (2008; pp.287-310) and Davenport (2005; pp.15-22) we shall discuss some of the common attributes of knowledge workers, as follows.

Knowledge workers like autonomy. Since their work cannot be framed in a routine structure with well-defined and aggregated tasks within a process logic, knowledge workers have to think in their own way and thus they don't like to be told what to do and how to do it. From this point of view, managing knowledge workers is quite different than managing industrial workers where the role of managers is to define the tasks for each worker and then to control the way they perform it. Many times the whole process has got such a complexity that even for managers, it is difficult to decompose it into simpler activities and tasks and to explain how to proceed in finding solutions. Knowledge work is intrinsically non-linear and cannot be decomposed like a linear one. Actually, any such decomposition may change the nature of the process. Peter Senge (1999) explained this phenomenon metaphorically saying that by cutting an elephant into two pieces we don't get two smaller elephants. Nonlinearity changes completely the nature of problems and of managerial logic de-

veloped by Frederick Taylor in his scientific management. Taylor considered that each process can be decomposed in elementary units of work he called tasks, and the manager's responsibility was to document and plan how this can be done: "Perhaps the most prominent single element in modern scientific management is the task idea. The work of every workman is fully planned out by the management at least one day in advance, and each man receives in most cases complete written instructions, describing in detail the task which he is to accomplish, as well as the means to be used in doing the work" (Taylor 1998; p.17). That logic is possible only for linear or quasi-linear processes. Knowledge work is a nonlinear process and cannot be decomposed following that logic. That changes completely the logic of knowledge management by comparison with classical industrial management. Relating nonlinearity with productivity in knowledge work, Drucker (2008; p. 290) states that "Two mediocre knowledge workers do not produce twice as much one first-rate one. They do not even produce as much as one mediocre knowledge worker". That is an essential fact for understanding knowledge management and how it should switch from linear to nonlinear thinking (Bratianu 2015b).

Knowledge workers need a different kind of motivation. That is an important issue since most of the managerial motivating systems are based on external rewards like money, cars, or vacations. Knowledge workers don't think only for their everyday living. They want more from their work. They want intelligent solutions and recognition from peers and managers. "What the knowledge worker needs to be positively motivated is achievement. He needs a challenge. He needs to know that he contributes. That is in complete contradiction to what we have come to consider 'good management' of the manual worker" (Drucker 2008; p. 288). Knowledge management should be able to create new motivating and rewarding systems for stimulating knowledge workers and challenging their thinking.

Knowledge workers value their knowledge, and don't share it easily. Knowledge is all the knowledge workers have. It is the output of their work and the means of performing different tasks. For them, knowledge is power and a guarantee of their useful work. Sharing their knowledge,

especially in a social context where competition among people is very high, may threaten their jobs. That is why knowledge workers are very reluctant to sharing their expertise for which they spent a lot of efforts and time. Knowledge management encourages people to share their knowledge and that happens currently in the Japanese firms as a result of practicing team management and of basic education focused on cooperation and team spirit (Nonaka and Takeuchi 1995).

Knowledge worker's productivity means quality not quantity. Productivity is a key concept in classical management and is measured by means of a linear metric containing time and quantity of units produced by a worker in that given time. The concept of productivity remains important in the knowledge economy but its content should be changed. "To make knowledge work productive will be the great management task of this century, just as to make manual work productive was the great management task of the last century" (Drucker 2008; p. 290). However, the content of the definition of that concept should be changed since knowledge work is a nonlinear phenomenon. That means that quantity should be replaced by quality and a new metric should be conceived for evaluating the knowledge worker productivity. We consider that a better solution would be to create a new concept based on a nonlinear metric to measure the output of the knowledge worker and not to extend the meaning of the old concept of productivity from a linear to a nonlinear domain. That will eliminate some errors made frequently today in measuring the knowledge workers' output in knowledge-intensive domains. For instance, in many European schools and universities, teachers and professors are paid according to a norm which is actually a linear metric based on physical hours of teaching. Measuring a knowledge transfer process by a linear metric is a conceptual error coming from the extension of the time norm of industrial workers to a new nonlinear domain like knowledge work. The solution of this problem can be obtained by changing completely the linear metric and not by its extension.

2.3.2 Knowledge Processes

Knowledge management cannot be properly understood if we don't identify the main knowledge processes within a firm. Let us consider a firm as an open system with well-defined boundaries of authority with respect to its environment. Then, within that firm we can identify the following basic processes: knowledge creation, knowledge acquisition, knowledge sharing and distribution, knowledge transformation, knowledge storing and retrieving, knowledge losing, and knowledge using. Knowledge creation and knowledge acquisition contribute to the increasing level of knowledge within organization, while knowledge losing to its decreasing. Knowledge sharing and distribution contribute to the restructuring of organizational knowledge and increasing its average level. Knowledge transformation is vital for knowledge creation and decision making since reflects the transformation of tacit into explicit knowledge on one hand, and the interaction between the rational, emotional, and spiritual knowledge fields. Knowledge storing and retrieving are functions designed for organizational memory and data bases. Knowledge losing comes into play when people with significant experience and expertise retire or leave for other jobs. Knowledge use means the convergence of all the other processes and represents the goal of knowledge management. We explain briefly each of these knowledge processes.

Knowledge creation. One of the fundamental attribute of knowledge is that it can be created. It is created by human brain as a result of a learning process which is stimulated by body and mind interactions with natural and social environments. By integrating individuals' knowledge within a social structure and amplifying it through different processes we get organizational knowledge. Nonaka and Takeuchi (1995) explain knowledge creation as a spiral process originating in the socialization process and going through conversion of tacit knowledge into explicit knowledge, combination of explicit knowledge of employees within a Ba, conversion of explicit knowledge into tacit knowledge and starting a new cycle with knowledge sharing through socialization. We shall describe this

dynamics in detail in the next chapter, but for the moment, we just wanted to show one of the most frequently used explanations of organizational knowledge creation. The process can be illustrated on a diagram with two dimensions: the epistemological and the ontological dimension. Along the epistemological dimension, the conversion from tacit into explicit knowledge, and the reverse, are represented; while along the ontological dimension, the increasing spiral from individuals to groups and organization is represented. In the paradigm of Data-Information-Knowledge-Wisdom (DIKW), knowledge creation is explained as a result of processing information which is rooted in processing raw data (Dalkir 2005; Davenport and Prusak 2000; Jashapara 2011).

Knowledge acquisition. Knowledge acquisition in organizations spans a large spectrum of activities aiming at increasing the organizational knowledge level. Knowledge acquisition refers to cognitive knowledge since emotional and spiritual knowledge are generated internally by employees. For many organizations, it can be useful to search for knowledge outside their boundaries and to acquire it in different forms. The most known methods are purchasing knowledge incorporated in data bases, scientific journals and books, or software programs. Knowledge can be acquired by hiring experts for solving some complex problems or initiating some new projects, and by hiring new people with good professional experience and records. Smart methods of knowledge acquisition can be designed as open innovation processes or by creating networks with other interested organizations in a certain business domain.

Knowledge sharing and distribution. Knowledge sharing is a form of knowledge distribution which is distinguished from all other forms because it is based on a personal willingness to offer experience and expertise (in a certain domain or with respect to a given problem) to other people. Knowledge sharing is an unconditional process of knowledge distribution which contributes to the increase of the average level of knowledge of a team or organization. In open systems, knowledge sharing proved to be a valuable mechanism for increasing the level of organizational knowledge and organizational entropy. "Knowledge sharing has been identified as a major focus area for knowledge management. The

importance of this topic lays in the fact that it aims to link the individual level, where knowledge resides, and the organizational level, where knowledge is applied and attains value" (Sanchez et al. 2013; p. 391). Knowledge sharing encounters a series of individual and organizational barriers which, aggregated together, result in knowledge *stickiness* (Szulanski 1995, 1996). A person's decision to share knowledge with somebody else depends on the trust between them. Trust is more a feeling than a rational argument, and is built on "the extent to which one is willing to ascribe good intentions to and have confidence in the words and actions of other people" (Cook and Wall 1980; p. 39). Knowledge sharing can be enhanced by creating communities of practice which are groups of people who share similar professional interests or hobbies. Unlike knowledge sharing, knowledge distribution happens as a result of managerial decisions and the needs of organization to benefit from its potential knowledge sources.

Knowledge transformation. The most known phenomena of knowledge transformation are those involved in tacit knowledge conversion into explicit knowledge through externalization, and of conversion of explicit knowledge into tacit knowledge through internalization. Both the processes of externalization and internalization are contained in the cyclic SECI model initiated by Nonaka (1994) and then developed further by Nonaka and his colleagues (Nonaka and Takeuchi 1995; Nonaka et al. 2008; Nonaka et al. 2009). As we presented in Chapter 1, the new theory of knowledge dynamics developed by Bratianu (2011; 2015), based on metaphorical analysis, introduces the multi-field theory of knowledge where three fundamental fields of knowledge are defined: rational, emotional, and spiritual. There is a continuous interaction between these fields, and transformations of one form of knowledge into another. This knowledge dynamics is important in understanding the decision making process and the performance of the firm.

Knowledge storing and retrieving. These processes are possible at both individual and organizational levels. Employees have the capacity of memorizing data, information and knowledge and retrieving it whenever it is necessary. At the organizational level, there are databases created

and supported by the information technology where data, information and knowledge can be stored in some codified structures in order to be easily retrieved. Also, knowledge can be embedded in different routines, regulations, patents and organizational culture which together can be identified as the organizational memory.

Knowledge loss. When people retire, they take their experience and expertise with them, which represents a loss for the firm. When a large group of employees retire at the same time, the loss of knowledge becomes significant and the firm may lose its competitive advantage (DeLong 2004). For instance, the retirement wave generated by baby boomers will lead to substantial knowledge loss if knowledge management does not create some strategies to reduce it. Also, knowledge loss can become a problem when there is a downsizing or reengineering of organizations. NASA could be such a negative example due to its many restructuring processes and massive retirement phenomena (Mahler and Casamayou, 2009).

Knowledge use. This is the final stage of any knowledge process: embedding it in goods and services. Smart products contain a high level of knowledge and intelligence embedded in their design, production and marketing. For instance, smartphones integrate a huge amount and a high quality of knowledge in their software, which make them very expensive products by comparison with their manufacturing costs. Knowledge use constitutes the kernel of knowledge management and the efficiency and productivity metrics of classical management have to be changed with new metrics able to measure the density of embedded knowledge and intelligence in goods and services.

2.3.3 Knowledge Management as an Emergent Process

In this Chapter, we have chosen an evolutionary approach in order to build up the conceptual framework of knowledge management and to

show how it is a product of the evolving dynamics of all the changes happened in the last fifty years in economy and organizational management. We decided to avoid starting with definitions, more or less adequate to the nature of knowledge management, in order to have an open view and a critical thinking approach than a prescriptive framework. Knowledge management is a new process but its emergence needed some historical time and significant changes in the post-industrial society. Knowledge management is not a fad or a new managerial fashion with a short life cycle. It is a different process since it involves intangible resources which are completely different from the tangible ones, and intangible processes which replace assembly lines and mass production. The “magical” economic concepts of *efficiency* and *productivity* lost their primary meanings and all linear metrics used so far for measuring production inputs and outputs proved to be outdated. Instead of enabling knowledge management, they constrain it by offering false interpretations of final results. Knowledge management is not an extrapolation of information management, although many authors even today use these thinking lenses, which are specific for it and for a technological approach.

The emergence of knowledge economy and knowledge-based organizations created the necessary conditions for the emergence of *knowledge management*, as a new managerial process able to deal with knowledge workers and knowledge processes. Knowledge management does not replace the classical management, but brings a new type of processes within the framework of organizational management: the knowledge-based processes. These processes are distinguished from other industrial processes due to operations with intangible resources. That means resources that cannot be seen, cannot be touched and as a consequence cannot be measured in the same way like tangible ones.

Knowledge management emerged as a new process in the organizational practice and at the same time as a new research domain for academics. Inputs and contributions for developing knowledge management came from a large variety of people with different professional backgrounds and professional philosophies, ranging from management to information sciences, and from epistemology to psychology and sociology.

Also, it is interesting to remark the fact that they came from different cultures which means different mindsets for understanding and working with knowledge. The explanation of such a large variety comes from the fact that *knowledge* is a universal concept but it is defined through the lenses of each specific domain. Also, managers and academics have different approaches to working with knowledge since, for managers, tacit knowledge plays the dominant role, while for academics, explicit knowledge does it. Moreover, for managers educated in the European and American universities, rational knowledge constitutes the basis of any analysis and decision making, while for managers educated in Japanese, Korean or Chinese universities, there is a balance between rational, emotional, and spiritual fields of knowledge. That means that knowledge management will emphasize primarily the analytics, mathematical decision making, and competition in Western organizations, while in the Eastern organizations the emphasis will be on knowledge sharing, judgment, and cooperation (Davenport and Harris 2007; Nonaka and Zhu 2012; Spender 2014).

Many authors, coming from information management, consider knowledge management just an extension of it, and overemphasize the role of information technology and Big Data in knowledge processes. It is true that information technology proved to be an efficient enabler of knowledge management, but it cannot replace the human dimensions. People trained in information science and information management use the concept of *information* in a different metric than those trained in social sciences. In the first case, information is just a mathematical concept which reflects a probability distribution of a data set, as it has been defined by Claude E. Shannon (see Chapter 1). Even though experts in computer science discuss about semantic information and semantic webs, they still use mathematical methods of analysis and cannot reach to knowledge as we discussed it in the previous chapter. In knowledge management, we use the Data-Information-Knowledge-Wisdom (DIKW) paradigm which gives a different content to information (Davenport and Prusak 2000; Dalkir 2005). In this new framework, *information* is a result of processing data and emerging in a field of meanings. Its importance in-

creases when we consider that, by processing information, we get knowledge. People who are not aware of this distinction may generate confusion when they express their views about knowledge management.

Hislop (2005), in a critical analysis of knowledge management based on the research done by authors like Alvesson and Kärreman (2001) and Scarbrough and Swan (2001), presented some weak points and inconsistencies of its theoretical foundations. The main aspects of these criticisms focused on the fact that basic concepts like “knowledge”, “management”, and “knowledge management” have fuzzy definitions and, sometimes, even contradictory formulations. That generated some ambiguity in understanding knowledge management and in implementing it adequately. We have shown in the first chapter that understanding knowledge is a metaphorical approach, and its interpretation depends on the kind of metaphors people use. Thus, it is explainable why different authors may get different meanings of knowledge and, as a consequence, of knowledge management.

The main limitations in understanding, explaining and especially implementing knowledge management come from the fact that it operates with resources which have two fundamental attributes that are completely different from physical resources: nonlinearity and intangibility. Nonlinearity creates real difficulties to all managers and academics who want to measure and process quantitatively knowledge by using linear metrics and mathematical models. Since these measurements cannot justify the managerial practice in organizations, people blame knowledge management for this. Indeed, we should understand that knowledge management needs a new paradigm to explain complexity and nonlinearity of intangible assets, and not to force it into the frame of the linear paradigm of industrial management. We have already discussed the new problems of motivating knowledge workers and measuring the outcomes of their work, which cannot be judged in terms of efficiency and productivity of the economics of tangible resources. The intangibility of knowledge resources and processes should lead to a new conception of management, since managers cannot operate and control them directly. Von Krogh et al. (2000; p.17) state this fact very clearly: “The real point is

that while you may be able to manage related organizational processes like community building and knowledge exchange, you cannot manage knowledge itself. Those who try to control knowledge creation do so at their peril, often putting up barriers or falling into the pitfalls”.

Knowledge workers need autonomy in planning and organizing their work which means that the difference between managers and knowledge workers decreased such that managers lost some of their authority. Based on this phenomenon, Davenport (2005) shows that as industrial workers created a need for professional managers able to plan, organize, lead and control their work, the emergence of a critical mass of knowledge workers now calls for a new managerial approach. “Because knowledge work can be and is done by managers as well as workers, strict separations between worker and manager no longer make sense. Because knowledge work has become the key to growth and differentiation in today’s economy, the differential in cost and value between knowledge work and management has decreased. Management in the ‘knowledge economy’ is a different game, with different rules” (Davenport 2005; p. 191).

Since knowledge is considered a strategic resource in achieving competitive advantage by many experts, knowledge management has a clear strategic dimension. In other words, knowledge management bridges the gap between operational management and strategic management, leading to strategic thinking and strategies design. However, we should go beyond seeing knowledge only as a resource, since knowledge is also vital in decision making. That means to change the meaning of *productivity* applied to knowledge workers or to define a new metric able to show that, for knowledge management, what matters is the quality of decision making and not the quantity of knowledge or ideas issued per unit time. The new mantra should be *working smarter* instead of *working harder*.

2.4 Conclusion

Knowledge economy is a fact today. Anticipated by Peter Drucker since 1969 in his famous book about economic discontinuities, the knowledge economy dominates in developed countries like United States, Japan, Korea, Northern and Western European countries. It is a new economy based primarily on intangible resources and on knowledge processes. From the scarcity of physical resources, economic theories of profit maximization and linear metrics for measuring efficiency and workers' productivity, things now changed to an abundance of intangible resources, economic theories of sustainability, and nonlinear metrics for intangibles which have not been defined yet. According to the World Bank Institute (2008) the major pillars of the new economy are the following: economic and institutional regime, education and skill of population, information infrastructure, and innovation system. Institutional regime should promote new legislation and administrative structures which stimulate knowledge creation, dissemination, and use as well as intellectual property. Education is important not only in quantitative terms of people graduating schools and universities but mostly in terms of developing generic skills necessary for new knowledge processes. Information infrastructure supports knowledge processes and enables knowledge workers to share their ideas and research findings with other people without any space and time constraints. Renewing the intellectual capital of organizations and achieving competitive advantage on a global market requires creativity and developing innovation systems. As demonstrated by Richard Florida (2002), with knowledge economy a new class of people is restructuring the society – the creative class.

The engine of the knowledge economy is the knowledge-based organization. As JC Spender underlined in most of his papers and books, the merit of analyzing the nature of the firm and its driving forces for growth must be ascribed to Edith Penrose, who explored the role of knowledge and their attributes as critical resources for any organization. Also, she showed how decision making is always subject to uncertainty and bounded rationality, as demonstrated by Herbert Simon (1976). Put-

ting together these ideas, we get the image of the knowledge-based organization as being primarily a bundle of intangible resources and dynamic capabilities that promote organizational learning and aiming at achieving a sustainable competitive advantage. When organizational knowledge processes reach the whole organizational structure, the firm becomes a learning organization. According to Peter Senge (1999), the main purpose of such a learning organization is to generate knowledge not only for its adaptation to a changeable environment but to contribute to its transformation. The learning organization is not a state-of-the-art but an ideal configuration to which any knowledge-based organization should converge. It is like a strange attractor in the theory of complexity.

In knowledge-based organizations, the critical mass of employees are knowledge workers. Their business is thinking and knowledge creation. They are not aggregated by assembly lines but integrated in networks and communities of professionals. Their work is not based on a physical effort but on an intellectual one, and their work schedule is not synchronized with a whole shift but desynchronized and made almost independent. Information technology shrinks space and time and allows global collaboration. Knowledge assets are owned by employees and can be only partially controlled by managers, in concordance with job requirements. Knowledge workers are less motivated by external rewards and more attracted by internal ones like job satisfaction and relevance of their contribution to the advance of knowledge in a certain field. Knowledge, being an intangible resource, cannot be managed directly as a physical resource but only through knowledge workers within a stimulating environment. Knowledge management has to optimize organizational knowledge dynamics and to motivate knowledge workers in powering business innovation.

Knowledge management emerged as a necessary process to deal with knowledge as the critical resource of organization, knowledge workers and knowledge work. Knowledge management is integrated in the firm's management but it departs from industrial management since it operates with intangible resources. Knowledge management bridges the gap between operational management and strategic management, since

knowledge represents strategic resources playing a crucial role in firm's competitive advantage. For knowledge management, strategic thinking becomes vital in designing strategies able to cope with future uncertainty and bounded rationality.

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