Competitiveness in the Knowledge-Based Economy

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Abstract

In a globalizing economy, competitiveness means information and know-how rather than capital and physical assets. The function of knowledge management is therefore to allow organizations to leverage their information resources and knowledge assets by remembering and applying experience. An organization's ability to compete on the market is increasingly seen as depending on the skills and knowledge of its employees, regarded as intellectual capital, and on its capacity to preserve and use as much as possible of this knowledge in knowledge-bases and expert-systems. However, knowledge evolves rapidly, due to the continuous changes of the business environment, and the useful life span of the organizational skills is decreasing, which means the survival and competitiveness of an organization is linked to its ability to produce and use knowledge as well as to include the results of the learning process in organizational competences and virtual products.

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JEL classification: D83

1. Knowledge Society vs. Information Society

More and more specialists refer to the current society as the knowledge or knowledge-based society, as opposed to, for example, the industrial society or the information society, due to the increasing importance of knowledge and of the means to produce, accumulate, transfer and use it in all areas of human activity.

The concept of information society refers to a human society in which the use of computer is extensive. This leads to a huge amount of information included in databases, and the emergence of the need to transfer and use them for a variety of purposes. The information society also has major consequences in focusing on the force of information, instead on the mechanic force characteristic to the industrial age. Work also changes from physical to intellectual. The natural question in this case is how different is the knowledge society in comparison to the information society and whether it was necessary to create a new concept for describing the contemporary society.

Since the information society is based on information, an obvious answer to this question can be an analogy to the difference made in informatics between information processing and knowledge processing. The knowledge society must be therefore considered an extension or an evolution of the information society.

According to most specialists, the knowledge society combines the knowledge representation and processing techniques with the multimedia communications provided by the World Wide Web. Therefore, while the information society's characteristics are the development of information technology, Internet and communications, the knowledge society is defined by the automatic search of relevant information and combining them into knowledge, data mining and machine learning. This means that the knowledge society uses the web-based knowledge representation techniques for B2B applications, e-commerce, e-learning, e-content etc.

2. Knowledge and the Knowledge-Based Economy

The knowledge processing techniques have become a necessity due to the enormous amount of information available on the web, especially when commercial transactions are involved. Therefore, a new concept emerges in economic literature: ***the knowledge-based economy***, seen as a new type of economy in which knowledge is placed in the very center of economic processes, as input, output and object of commercial transactions. This leads to a re-evaluation of the relationship between knowledge on one hand and the traditional resources (material, financial, human and informational) and outputs of the economic activity, on the other hand.

The idea of using knowledge for gaining profit is essential for the knowledge-based economy, since knowledge is considered to play a multiple role:

- The role of input or resource used in production processes, with a considerable impact on the efficiency of traditional resources and on the life cycles and life span of the end products.
- The role of output of the economic activity, with an increasing importance compared to that of the traditional outputs (products, services), instead of considering it a simple side effect or auxiliary product.
- The role of object of commercial transactions, which implies an economic value of knowledge, given, among other things, by the costs associated to the processes of knowledge production.

Consequently, the main characteristic of the knowledge-based economy is that it pushes knowledge forward into a leading position in all economic areas. The reason for this is the powerful impact knowledge has on the functionality and competitiveness of organizations, impact even greater than that of the traditional resources. Because of the intangible nature of knowledge, new protection and management methods are necessary, which explains the interest shown by many specialists to the difficult problem of intellectual property protection.

Presently, the economic activity can no longer take place in the absence of intangible resources (knowledge), and a similar phenomenon can be observed regarding its output: companies change focus from the production of goods and the information processing to cumulating knowledge and production of knowledge-goods, reflected in the emergence and continuously extended use of virtual products and equipments: cards, software, e-banking, consultancy etc.

Another characteristic of the knowledge-based economy is a globally noticeable attempt of specialization in certain areas of knowledge, which eventually means that companies no longer need to absorb huge amounts of physical and human resources. Instead of obtaining performance through quantity and volume, companies base their competitive advantage on the knowledge they manage to gain and use.

In order to give a more operational dimension to the concepts specific to the knowledge-based economy, a complex definition of knowledge is in order:

Knowledge *is a more operational and extensive concept than information from the content, meaning, value and size point of view, with a high level of context dependence and pattern understanding (considered as cumulated inventories of information describing reality at a profound level and allowing its transformation in order to reach certain objectives). Knowledge has the capacity to produce value and is the element on which individual and organizational competences are based on*.

Access to knowledge means a certain level of pattern understanding and recognition, which eventually leads to the creation of new patterns. If there is any possibility for information to form a pattern, than there is a good chance for the emergence of new knowledge. The context is essential for these knowledge creating patterns, because it gives them a certain level of predictability when applied (**figure 1**).

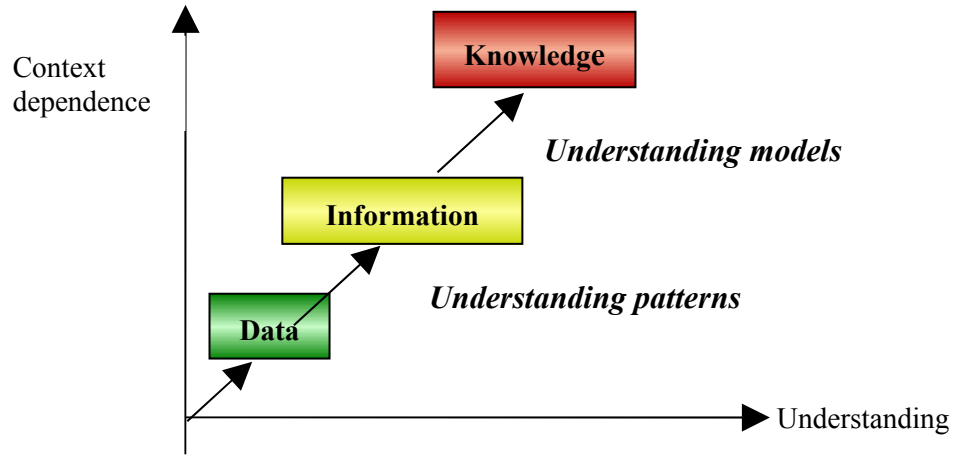

Figure 1 The relationship between data, information and knowledge from the point of view of context dependence and understanding of models and patterns
Source: Ian Watson (University of Auckland) – *Applying Knowledge Management – Techniques for Building Corporate Memories*, Morgan Kaufmann Publishers, 2003

However, there are types of knowledge that cannot be expressed as explicit patterns and models. These are the intangible (or implicit) knowledge, that unlike the articulate, explicit knowledge, are subtle, personalized, informal and difficult, if not impossible, to communicate between individuals and groups.

The difference between these types of knowledge is exemplified in the following table:

Types of organizational knowledge	**Expressions of organizational behavior for:**		
	Individuals	**Groups**	**Organization**
Explicit (articulate) knowledge	Professional qualifications Permanent memories	Projects Rules for cooperation.	Organizational structure Rules and work procedures Accumulations of information and knowledge
Implicit knowledge	Personal experiences Informal relationships.	Common representations Cognitive maps.	Values of organizational culture "Esprit de corps".

Source: G. Hedlund – *A Model of Knowledge Management and the N-form Corporation, Strategic Management Journal,* no. 15 (Summer Special), 1994

Although knowledge and information are obviously separate entities, there is a dynamic and interactive relationship between them, as shown in **figure 2**. Information is essential for the creation of new knowledge, and knowledge continuously generates new information, in an endless cycle. Therefore, information is considered to be both a resource and a much needed environment for the emergence of new knowledge.

The difference between information and knowledge (as well as the difference between database and knowledge-base) can be also pointed out by using the vocabulary specific to the computer science. From the point of view of AI (artificial intelligence) specialists, there is a so called knowledge level, situated above the software level (also referred to as the symbolic level), which is superior to that of hardware (circuits, devices etc.). This new knowledge level is in fact the main difference between the knowledge (or knowledge-based) society and the information society. This level includes goals, actions and pieces of knowledge, the latter forming knowledge-bases or *onthologies*.

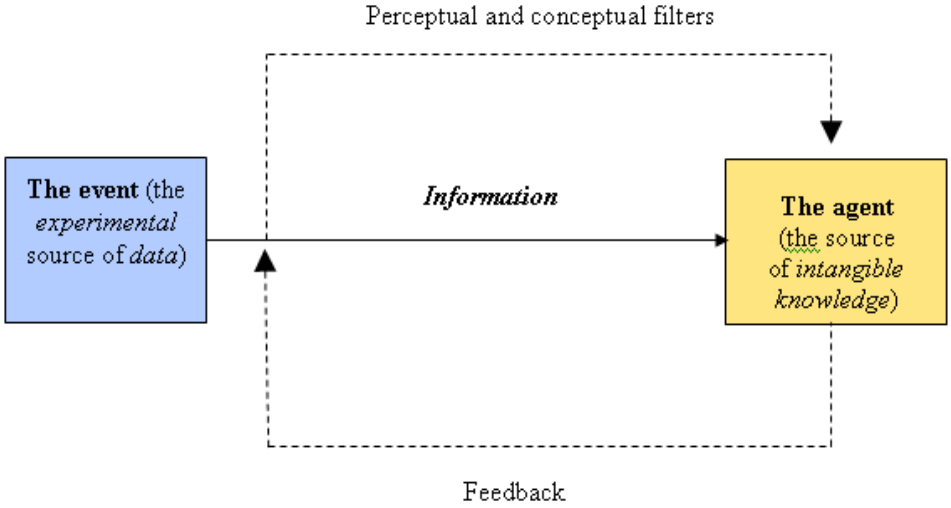

Figure 2 The dynamic relationship between data, information and knowledge
Source: M. Boisot – *Knowledge Assets: Securing Competitive Advantage in the Information Economy*, Oxford University Press, 1998

3. IT Knowledge-Bases and Expert-Systems

In the case of "classic" software, knowledge is usually implicit, even if the software in question is a database management system. Generally, knowledge is included in the algorithms or mathematic models the software is based on. But there are also problems for which there is no valid algorithm or the existing algorithm is inoperable due to large execution time. Other problems have incomplete or changing specifications. And in many activities and industries, most problems are like this.

In the attempt to solve this kind of problems, a new type of software was developed: the so-called ***expert-systems***, mint to solve problems just like a human expert, and based on the problem solving patterns used by humans. The mind analysis of human experts lead to the conclusion that what makes them unique is not only the knowledge they possess, but also the way this knowledge is structured. This observation established that, in order to solve problems, the explicit representation of specific knowledge is necessary. On the other hand, the knowledge-base must be expandable, since one of the most important characteristics of human activity is the continuous accumulation of knowledge.

Therefore, the expert-systems are based on the concept of artificial intelligence, which simulates the processes of natural human reasoning. The expert-system uses, interprets and multiplies a series of artificial reasoning processes that cumulate and apply human experts' knowledge.

The basic elements of an expert-system are:

- The means to represent knowledge, which insures the conversion and the transmission of the information offered by the human expert;
- The knowledge-base, which contains the specific knowledge and whose construction implies a number of elements:
  - Creating the knowledge-base: processing the expert's knowledge and creating a knowledge inventory by following a certain representation method (production rules, frames, semantic networks);
  - Validating the knowledge-base: an interactive check of how correct the base is;
  - The base of facts: contains the data that characterize a problem which needs to be solved as well as the facts resulted from the artificial reasoning performed by the inference engine by using the knowledge-base;
  - The inference engine: solves the given problem by using knowledge to develop an artificial judgment that may lead to a whole new set of facts. It is a component of the expert-system generator;
  - The expert-system generator: consists of programming systems connected to the knowledge-base.

Due to the complexity of economic phenomena, companies use multiexpert systems defined as two or more coherent and co-operative expert-systems that can be use individual or in interaction.

An essential difference between "classic" software and knowledge-based software is that the first contains implicit knowledge, while the latter contains explicit knowledge. A knowledge-based system is a piece of software that intelligently solves complex problems by focusing on an explicit representation and processing of knowledge. The knowledge that the system uses is actually the experience gained by human experts in similar problem solving processes. This knowledge is referred to as an *ontology*, which includes all the rules and restrictions that define the search area.

The concept of ontology was first brought up by philosophers, who used it to describe the theory on existence, or on what the theorist considered to be existence. Onthologies are the starting points of all philosophical systems, because they clear the issues referring to the basic categories of entities describing reality and the relationship between them.

This type of ontholgy is not always explicit, but any philosophical argument is dependant on it. Most AI software process structures of symbols that represent the specific knowledge for the considered domain. These structures of symbols are brought together in a knowledge-base that is in fact a model of the domain in question.

4. Organizational Knowledge-Bases and their Importance in Terms of Competitiveness

In the case of organizations, the knowledge-base includes both the personalized knowledge that human individuals and groups have and use and the artificial knowledge provided by the intelligent IT systems.

As a consequence, the knowledge-base has the attributes of an extended organizational memory, able to support specific autonomous projects and beneficiate of their cumulated results.

According to the definition above, the main characteristic of the knowledge-based economy is the fact that it assimilates knowledge to both organizational inputs and outputs. While as an output, the role played by knowledge in commercial transactions is obvious, its role as an input and its relationship to the other organizational resources need some clearing up.

As an organizational resource, knowledge is considered to be dependent on the human and informational resources (**figure 3**). However, knowledge is more than the simple sum of these other resources, somehow like a painting is more than a certain quantity of paint and a canvas. Moreover, knowledge is the resource that has the strongest impact on the efficiency in use of all the other organizational resources, especially the physical and financial ones (investments).

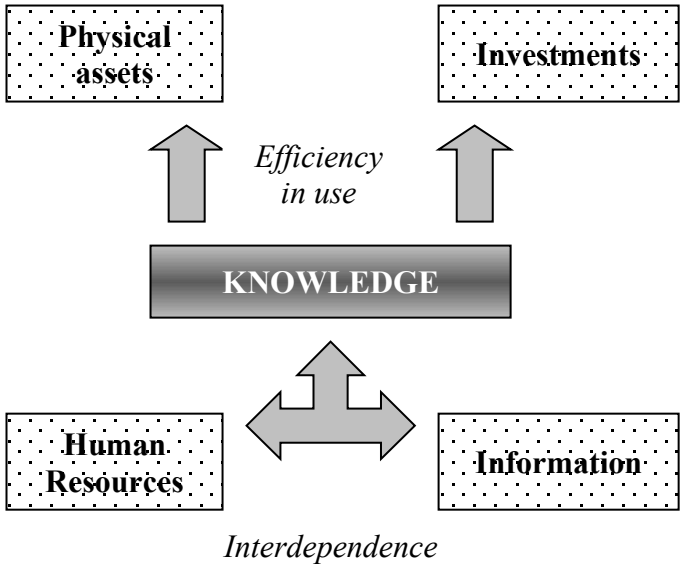

Figure 3 The relationship between knowledge and the other organizational resources

The study of organizational and IT knowledge-bases encourage companies to build and use knowledge-bases on a broad scale, which ultimately leads to an increased level of awareness regarding any piece of individual or organizational knowledge the company possesses.

The ever-growing importance of knowledge in economy (whether it comes to acquiring competitiveness, innovating or supporting economic growth) leads to changes in many economic areas, such as logistics. Since knowledge is now seen as a resource, as well as an output and an object of commercial transactions, logistics will have to provide the necessary knowledge for the organization, to coordinate the processes of innovation, knowledge transfer and knowledge use in order to acquire a competitive advantage that may allow the organization to join strategic alliances or organizational networks.

However, the processes of creating, acquiring, transferring and storing knowledge raise a problem: how can the useful and relevant knowledge can be separated from the large mass of data and information. The solving of this problem is up to every organization and defines its ability to acquire a competitive advantage based on the knowledge assets it owns.

Moreover, managing the company's own knowledge and creating organizational competencies based on this knowledge brings a number of benefits to organizations, the first of which is diminished costs. Even though costs are not the only aspect that benefits from the use of the organizational knowledge-base, the effects on other areas are harder to see due to the difficulty of evaluating them.

In the knowledge-based economy, organizations owe most of their opportunities (and the added value they create as a consequence of seizing these opportunities). This raises the issue of the best ways to completely exploit the available knowledge. Most knowledge management specialists agree that in order to have optimal results while facing competition, knowledge must be shared and used as a basis for cooperation between organizations (just like it happens in an exploration network).

This way, an effective knowledge management would allow organizations to:

- Stimulate innovation by encouraging the free circulation of ideas;
- Improve client service;
- Increase sales by reducing the time elapsed between production and distribution of products and services on the market;
- Increase the rate of human resources' development by acknowledging the value of individual and group knowledge and rewarding the accumulation and use of knowledge;
- Improve operations and reduce costs by eliminating unnecessary and useless processes etc.

A creative approach of knowledge management leads not only to the improvement of immediate economic results of organizations (such as increased sales or higher profits), but also to the emergence of long term competitive strategies which allow each organization to act specifically and differentially on the market.

However, it is important that organizations understand that the value of knowledge is not the same over long periods of time: knowledge is considered to

be perishable asset, and this means that in order to keep up, the methods used by knowledge management have to adapt permanently.

Survival in a knowledge-based economy is linked to the organization's ability to accumulate any relevant and useful information and knowledge from the environment (therefore becoming a *learning organization*) and properly decide what to use and what to share of its own knowledge, adjusting its knowledge management techniques to this processes.

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