# ICT, INFORMATIONAL INNOVATION AND KNOWLEDGE-BASED ECONOMY

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*ABSTRACT: This paper suggests explaining the main important role of new economic information providing competitive advantages which help economic development. It highlights a new "intelligent model» which produces and chooses the right competitive information, as a result of informational innovation which ensures the maintaining of the stability of economic growth in a new knowledge based economy. The proposed model describes the major role of information in different kinds of innovations which provide an intelligent strategy: business, organizational and knowledge intelligence, which should be followed by the decisions to improve the competitive advantage and intelligence of their organizations. We are integrating a dynamic interaction between each component of this model which had been tried by using ICT and a new crucial component in the model which is informational innovation.*

*Key words: ICT, Informational innovation, competitive intelligence, competitive advantage, knowledge-based economy.*

*JEL codes: D89, L86, M29, O39.*

## Introduction

Due to the proliferation of information communication and technology (ICT), knowledge-based economies have played an important role in the economic activities of the OECD economies.

New economic theories include directly more knowledge as a factor in the production functions (Griliches, 1979), because investments in knowledge embodied in people and technology increase the productivity of labor and capital and result in new products and processes.

The importance of the new information in the knowledge-based economy, as a key source of competitive advantages, is now well established in the economic studies (Nonaka, 2001). However, when we look at the new competing landscape, development seems to be based mainly on the technological revolution and on the globalization increase. To govern the informational economic system in this new competing landscape and to establish a flexible development maintained by the competitive advantage, Therefore, a new type of organizational model and an innovational process should be developed (Hitt and al., 1998).

This paper provides a theoretical background of the economic aspects concerning innovation, particularly as the informational one which provides competitive advantages in an area of knowledge-based economy. Indeed, we aim to explain the relationship between competitive intelligence and informational innovation and to improve "the intelligent model" which maintains economic growth.

We will develop three points in this paper:

- The characteristics of new knowledge-based economy.
- The relationship between information and knowledge and how to create either of them?

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- Describe the intelligent model and improve the dynamic role and power of informational innovation in it.

**The Origins of Modem Economic Growth**

In an increasingly globalized economy, information technology is one of the key factors of competitiveness and growth of firms and countries. Firms are becoming more and more competitive due their knowledge, rather than to the natural endowments or the low labor costs. It is becoming increasingly clear that the role of the traditional sources of comparative advantages (a large labor force and abundant natural resources), in determining international competitiveness, is diminishing.

The competitive and comparative advantages of countries are gradually being determined by the access to information, innovation and evolutional knowledge creation process. The only comparative advantage that really counts is the man-made-one (education and skills). It is engineered by knowledge through the use of information (Oshikoya and Hussain, 2006).

The recent advances in economic information are becoming essential in the process of the socio-economic development. Information technology offered new ways of exchanging information and transacting businesses. It change the nature of the financial and other service sector and provides efficient means of using the human and institutional capabilities of countries in both the public and private sector. The world is rapidly moving towards knowledge-based economic structures and information societies, for instance network of individuals, firms and countries that are linked electronically and having common business (Oshikoya and Hussain, 2006).

The universalization and the advent of new technologies of transmission of information place the knowledge and the information in the heart of the regulation in the economic development. The fast increase in the exchanges of goods, services, capital and the new ideas reinforces today the interdependences between the economies. The context of communication and information technology (TIC) is that of the new economy which is characterized by the evolution of the process of the globalization and development of the information companies. Thus, with the standardization of international information, such as international network, and the acceleration of the exchange in widened spaces of the Common Markets (following regional integration) have created more opportunities for the diffusion of technology. Moreover, this last international environment managed by new information technology exacerbated the race of competition at the international level.

Knowledge creation is planning a major role in the capitalist economies. Therefore, business organizations must constantly create new knowledge to guarantee their survival. To be a competitive firm in the contemporary economy, it is necessary to continue innovating industries and firms that were formerly and comfortably protected and with slowly evolving markets, are being swept by the accelerated change. Nonaka and Takeuchi (1995) were the first authors to focus on how knowledge is created. They also stated that the fundamental importance of today's firms is to create new knowledge and activate the innovation process. To be competitive, a firm must be transformed into an organization mobilized by the knowledge creation.

This paper reflects the changing temporal dynamics of innovation, which characterizes the state of knowledge in the firm at a particular moment. The products released from the knowledge-creation process, become static while the firm rushes into the future. With knowledge in its various aspects such as the increasing arbiter of value, innovation (i.e., new knowledge creation), has become the key to successes in the global marketplace.

The increase of the number of organizations encouraging continuous innovation has profound effects on the world economy. Actually, Martin Kenney (2001), states that innovation has to contribute it successful production, assimilation and exploitation of novelty in the economic and social spheres. Innovation has to spread in technology, in the system architecture, in the end

services and their financing and in the industrial organizations. It should finally contribute to the shortening of the production time, improve the quality and reduce the cost of services for the communities.

**What kind of innovation is needed in the knowledge-based economy?**

To explore new developments and have more opportunities to competitiveness in an area of knowledge-based economy, organizations or governments should catalyze more beneficial creation and sharing of information.

**What's informational innovation?**

De Meyer and Garg (2005) define innovation as follows:*"Innovation is the economically successful introduction of a new technology or a new combination of existing technologies in order to create a drastic change in the value/price relationship offered to the customer and/or user".*

Innovation is traditionally conceived as the product of investments in knowledge. It is the knowledge production, but it is also the product of knowledge externalities (Le Bas, 2004, 2006). Informational innovation basically requires a learning continuity and access to knowledge.

**Creation and evolution of information**

**How to create information?**

It appears that the Internet has changed the way many firms do business, and has the potential to revolutionize business practices even further. All these changes have to do with using technology to transfer information or knowledge-connecting people in different functions and locations in their quest to solve problems and create new knowledge.

During the tech boom, the business press often runs articles about the next big thing, from business-to-consumer (B2C) to peer-to-peer (P2P) to business-to-business (B2B) strategies:

The term P2P already carries significant baggage in many people's minds, as it is often associated with the illegal sharing of MP3 music files, software and movies on the Internet. However, the term in its usual Internet context means, in fact, only 'peer-to-peer' and the definition of a 'peer' is non-specific. In fact, P2P means many different things for different people. Communication applications, like email and 'Instant Messaging' (IM), are sometimes referred to as P2P or being closely related, because they are 'user-to-user' services. The Banking and Finance industries use the term P2P to indicate 'person-to-person' financial transactions like those made through 'Western Union'.

The thing that is often overlooked is that some of the major achievements on the web, YouTube, MySpace and Facebook for instance, are facilitating the aspects of the peer-to-peer.

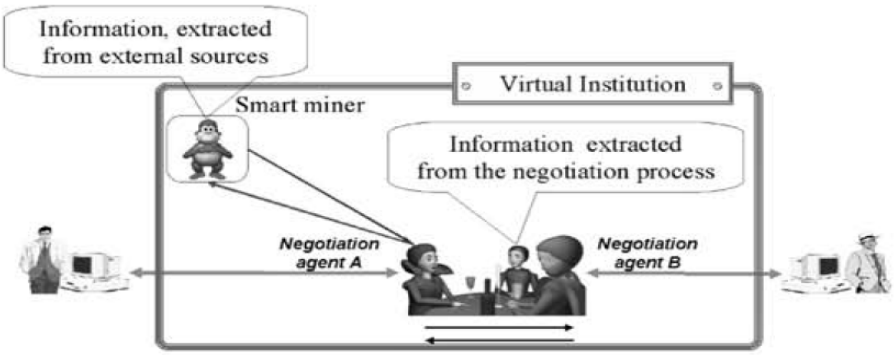


**Figure no. 1. - Creation of Information: peer-to-peer process**

Michel Bauwens and Rémi Sussan (2005) explained that with the set of cognitive capitalism today based on the P2P communication infrastructure, without which collaborative processes within and between companies would be impossible. Some companies, which we call "netarchiques", are based explicitly on the facilitation and operation of participatory processes - *Amazon*, *Google*, *eBay*, etc.

**The Information Evolution.**

First, let us look at the five dimensions of the Information Evolution Model. The evolution of information depends on the nature of the economic, political, geographic, social, cultural and ethnic interactions which are strengthened by globalization and information network (Miller and al., 2006).

The five levels of the Information Evolution Model below, figure1 (operate, consolidate, integrate, optimize, and innovate) are all milestones in an organization's evolution in the use of information as a strategic corporate asset for better decision making (Miller and al., 2006).

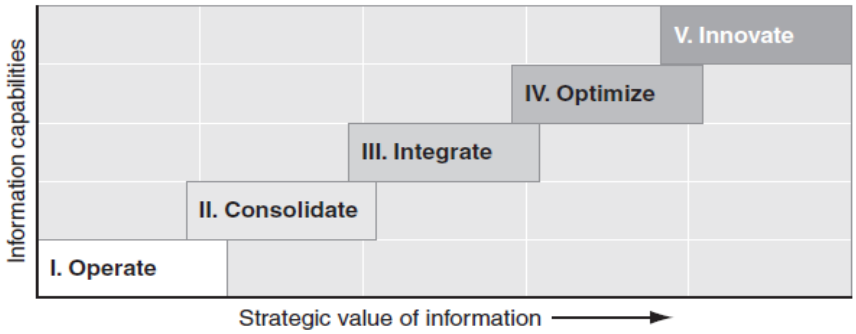


**Figure no.2. - The Information Evolution Model**
*Source: Miller G J., and al., (2006), SAS Institute, Inc., U.S.A.*

The Information Evolution Model (IEM) (fig. n. 2) describes the way in which organizations use information to advance the short- and long-term business objectives. The use of this model offers the organization a competitive advantage, like how enterprise-wide intelligence enables better decision making to keep up with competition or gain a competitive edge in the marketplace, that is how to implement solutions in order to support those goals, how to establish an understanding and changing process, and how to use information throughout the organization (Miller and al., 2006).

Although the terms "information" and "knowledge" are often used interchangeably, there is a clear distinction between them. Information is a flow of messages, while knowledge is the product of that very flow of information which is anchored in the beliefs and commitment of its holder (Nonaka and Toyama, 2001).

The term "knowledge processes" refers to the processes that deal with these issues: How information is generated, validated, and used. How information is tied to performance metrics and reward systems. How the organization supports its commitment to the strategic use of information.

To create new knowledge, it is necessary to make an intelligent action on information. Due to the diffusion of ICT, this dynamic relationship between information and knowledge becomes easy and the stock of knowledge increase rapidly.

**A Dynamic of Knowledge transformation and creation.**

In a different theatrical approach, Knowledge foundation and production go through four steps of creation and utilization. Nonaka (1994), Nonaka and Takeuchi (1995) proposed an influential model of organizational knowledge creation based on a distinction between tacit and explicit knowledge. In this model, S: stands for socialization; E: for externalization; C: for combination; and I: for internalization.

According to Nonaka, knowledge is created in a process where tacit knowledge is socially shared and converted into explicit knowledge, and explicit knowledge is combined with existing explicit knowledge and converted back into tacit form where it guides action. Nonaka called these different modes of knowledge conversion "socialization", externalization", "combination", and "internalization", and the resulting knowledge creation model the SECI-model. In the Japanese concept, this model is called Ba and roughly seen as a 'space'. According to this concept, there are four different types of Bas: Originating Ba, Dialoguing Ba, Systematizing Ba and Exercising Ba.

To exploit and create knowledge effectively and efficiently, it is necessary to link it with time and space. We call such space Ba. It is a sophisticated concept and cannot simply be understood as a physical location or space. Ba was defined, in knowledge creation, as a platform where knowledge is created, shared, and exploited (Larisa V. Shavinina, (2003)).

According to Nonaka and Konno (1998), Ba can be thought of as a shared space for emerging relationships.

This shared space provides a platform for advancing individual and collective knowledge.

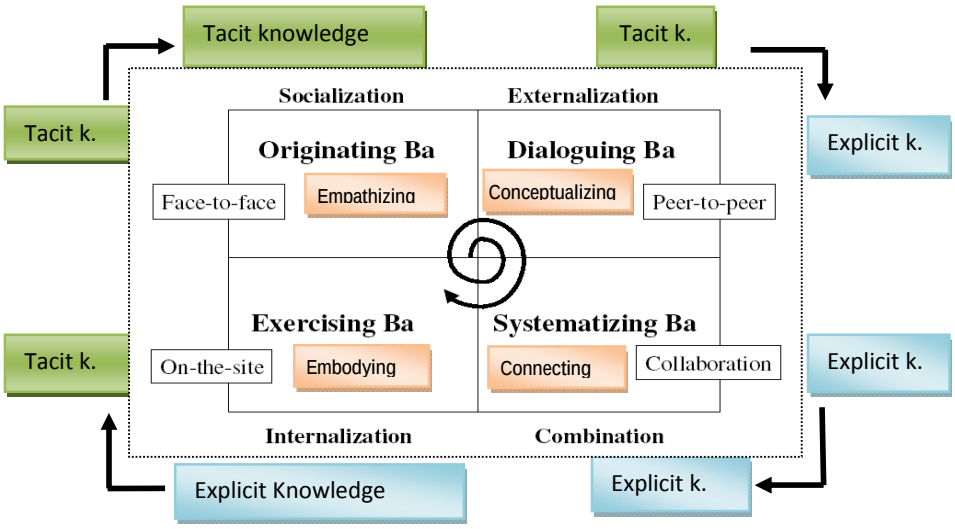


**Figure no. 3. - Dynamic of Knowledge Production Process (The SECI or Ba Model)**

To explain the dynamics of the knowledge creation model (fig. n. 3), Larisa Shavinina, (2003) give eleven points involving the dynamic interaction between the four modes of knowledge conversion: socialization, externalization, combination and internalization of knowledge. These are:

***- Socialization; from tacit to tacit (face-to-face), Sharing and creating tacit knowledge through direct experience.*** In this step we have three points:

1- Walking around inside the company

2- Walking around outside the company

3- Accumulating tacit knowledge
4- Transferring tacit knowledge

***- Externalization; from tacit to explicit (peer-to-peer) Articulating tacit knowledge, through dialogue and reflection.*** Two points are developed:

5- Articulating tacit knowledge
6- Translating tacit knowledge

***- Combination; from explicit to explicit (collaboration), Systematizing and applying expling explicit knowledge and information:***

7- Gathering and interacting explicit knowledge
8-Transferring and diffusing explicit knowledge
9- Editing explicit knowledge

***- Internalization: from explicit to tacit (on-the-site), learning and acquiring new tacit knowledge in practice. In this step there are two points:***

10- Embodying explicit knowledge trough action and practice
11- Using simulation and experiments

In recent years, knowledge has been a source of sustainable competitive advantage (Nonaka I., Konnon. and Toyama R., 2001). It is certainly a crucial resource to create value for the next generation, the industries, and companies. Many companies still seem to be locked in the phase of building efficient and effective information technology (IT) systems when they try to "manage knowledge."

**The economic Intelligence Model**

In the new vast world, which is characterized by an international economic openness, by common market and by international diffusion of information and communication technology (ICT), competition between countries is increasing and the search of competitive advantages and intelligence is the best solution to maintain these market parts and economic growth and development in an area of knowledge-based economy.

The most important sources of competitive advantages developed in the literature of economic growth are Business, Organizational, Knowledge and Competitive intelligence. Information, as the crucial resource of effective innovation, produces the competitive intelligence which is a result of business, organizational and knowledge intelligence as a consequence of the use of ICT.

In the new economy, moving into new markets provides many opportunities and multiple challenges. For example, entering global markets increases incentives for innovation and helps gain returns on innovation because of the expanded marketplace (Hitt and al., (1998) p.24).

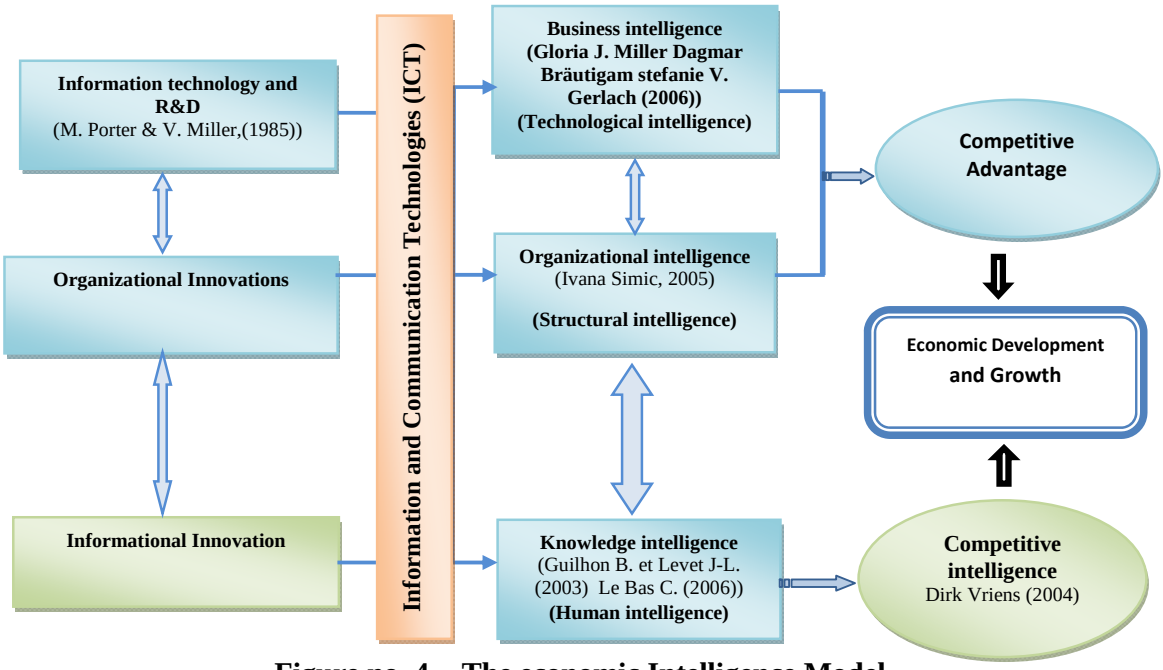


**Figure no. 4. - The economic Intelligence Model**

In this intelligent model (fig. n. 4), ICT offers many opportunities to support (and sometimes carry out parts of) intelligence activities. To make sure that these activities can be carried out properly, an organization should implement a so-called "intelligence infrastructure". Three parts of infrastructure have been distinguished by Vriens (2004): (i) a *technological intelligence*, comprising the ICT applications and ICT infrastructure that can be used to support the (stages in the) intelligence cycle, (ii) *a structural intelligence*, referring to the definition and allocation of competitive intelligence tasks and responsibilities and (iii) a *human resource intelligence*, which has to do with selecting, training and motivating the personnel that should perform the intelligence activities.

ICT generates more data when a company performs its activities, as it enables it to collect or capture information that was not available before. Citizens, consumers and governments can create, re-use and distribute information that adds maximum value.

Information consists of two types: codified and non-codified. It can easily gain access to codified knowledge. But to innovate, a lot of non-codified knowledge is often require (De Meyer and Sam Garg, 2005)**.** This non-codified knowledge comes mainly through people. The scarcity of good technical and human resources in Asia is perhaps an important hurdle for this transfer (availability of human capital).

Without the appropriate human resources, creative entrepreneurs will not be able to achieve their objectives. They may be stopped if they do not have quantitative and qualitative of technical infrastructure, engineering, design and management skills, and creative employees. The availability of these resources depends on the government initiatives (De Meyer and Sam Garg, 2005).

**The role of information in the new world**

Since 1985, Porter and Millar have been considering the following issues, "How information revolution is transforming the nature of competition and how information gives a competitive advantage" These questions give us a power of information which is increasing nowadays because of their increasing need in the new economy.

Information produced by the public sector or created by the citizens has an economic value.

- The public sector information can generate, tow different kinds of economic value: (i) a direct value: a revenue generated by the government through the selling of information to the public sector; and (ii) a commercial value: a revenue generated by companies with use the public sector information.

- Several studies showed that using the internet develops the customer's knowledge and the collective consumer's power, leading to an improved quality of goods and services, to innovation and often to lower prices: (e.g. A Burst Media survey of over 2,000 web users, who planned to travel in the next three months, showed that nearly half of the respondents (47.2%), who intended to use the web when planning their upcoming travel, said that the internet would be their primary travel resource. In 2006, 20% of UK survey respondents booked their most recent holiday online, compared to 12.4% in 2004) (Ed Mayo and Tom Steinberg, 2007).

The ICT diffusion is increasing the value of information. If we limit ourselves to the internet example, we can say that the use of the internet becoming widspread and affecting the citizens in different ways (Ed Mayo and Tom Steiberg, 2007). Popular internet sites make it easy to create information and to consume it. These tools include:

• Forums and chat rooms that allow people to post questions easily and get answers on issues of common concern (e.g. The Thom Tree Travel Forum);

• Social networking tools that allow people to keep track of the interests and activities of their friends (e.g. MySpace and Facebook);

• Bloggings and video sites that help citizens to become writers, publishers and video producers (eg YouTube, Blogger, Twitter …); and

• Wiki-Based sites that enable joint creation of large and diverse repositories of user-generated information on particular topics (e.g. Wikipedia).

**The role of ICT in innovation**

ICT plays a major role in the innovation process. First, ICT is the technological area with the highest rate of innovation as measured by the granted patents. Among other things, the high rate of patenting in this area points to the several changes in ICT hardware and software that are needed to use ICT effectively. Second, ICT is enabling many of the changes in the economy and the innovation process that help make other economic sectors more innovative (OECD, 2000).

- ICT has helped to break down the natural monopoly character of services such as telecommunication. This has enabled regulatory reform, fostered productivity growth and made these services more tradable, so that investment in innovation has increased and become more innovative.

- ICT is a key technology for speeding up the innovation process and reducing the cycle duration, resulting in a closer link between business strategies and performance.

- ICT has fostered greater networking in the economy, as it has facilitated outsourcing and co-operation beyond the firm. It also appears to be a major driver for the globalization process.

- ICT makes possible faster diffusion of codified knowledge and ideas within and across borders.

- ICT has played an important role in making science more efficient and linking it lightly with business.

The roles of innovation and information technology in recent growth performance are closely related. Some recent changes in the innovation process and related impacts on innovation could not have occurred without ICT.

**Conclusion**

In a new economy based on knowledge and information, there are two sources of economic development: competitive advantage and competitive intelligence. The former is provided by Organizational intelligence (Ivana Simic, 2005) and Business intelligence (Gloria J. Miller Dagmar Brâutigam Stefanie V. Gerlach, 2006). The latter is a more important factor since it has informational innovation and ICT diffusion as the primary source of knowledge intelligence (Guilhon B. and Levet J-L. (2003) and Le Bas C. (2006)).

**Acknowledgments**

The most significant idea provided by the intelligence model and developed in this paper is the integration of information and knowledge in an economic analysis. These two immaterial economic factors need to be personalized and quantified at a certain price. But the question here is: how can we attribute a price for an immaterial factor?

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