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# IZAZOVI TEHNOLOŠKIH INOVACIJA - EKONOMIJA ZNANJA I ORGANIZACIONE PROMENE

# CHALLENGES OF TECHNOLOGICAL INNOVATIONS - KNOWLEDGE ECONOMY AND ORGANIZATIONAL CHANGE

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***Apstrakt:***

*Glavni cilj ovog rada je diskusija, testiranje i davanje prijedloga glavnih komponenti i faktora uspjeha Paradigme nove ekonomije za investiranje u organizacionu promjenu. Model industrijske ekonomije zamijenjen je onim koji je tehnološki rukovodjen, npr. ekonomski model vođen znanjem. Menadžment znanja je bio predmet kratke analize, budući da je smatran glavnom determinantom ekonomske produktivnosti. Stoga, ispitivanje da li investiranje u znanje i vještinu dugoročno donosi ekonomsku nagradu, ovaj rad će se fokusirati na ljudski kapital kao relevantni indikator porasta produktivnosti, kako u organizacijama tako i u državi. Svaki pojedinac ima kapital koji leži u tehnološkim inovacijama dok organizacije i države moraju naučiti da rukovode onim što obuhvataju inovacije i ljudski kapital. Konstantne inovacije u novim tehnologijama i načinima razmišljanja i djelovanja imaće za rezultat ekonomski i produktivni rast.*
*Ključne riječi: menadžment znanja, nova ekonomiija, ljudski kapital, informacione i komunikacione tehnologije, organizaciona promjena, inovacije, ekonomski rast, rast produktivnosti.*

***Abstract***

*The main purpose of this paper is to discuss, test and propose main components and success factors of a New Economy paradigm for investment in organizational change. The industrial economy model has been replaced with a technology driven, i.e. knowledge driven model of economy. Knowledge management has been a subject of brief analysis being considered as a key determinant of economic productivity. Therefore, examining whether the investments in knowledge and skills brings long term economic rewards this paper will focus on human capital as a relevant indicator of productivity increase, both in organizations and within a state. Individual itself holds the capital that lies in technology innovations while the organizations and states have to learn to manage the knowledge comprised of innovations and human capital. Constant innovations in both new technologies and new ways of thinking and doing things will result in economic and productivity growth.*
***Key words:*** *Knowledge management, New economy, Human capital, Information and communication technology, Organizational change, Innovations, Economic growth, Productivity growth.*

## Introduction

*''It has become appallingly obvious that our technology has exceeded our humanity"*
Albert Einstein

This paper will try to explain the development of economy by enforcing the skills and knowledge of the work force that follow the economic and technological change, and will explore the concept of innovations derived from human capital. I have been challenged to review and assess many of the relevant academic literature, articles and surveys. The material I gathered and research I conducted will analyze this very complex and interdisciplinary topic.

Firstly, technology and knowledge as key factors of production are going to be investigated along with the concept of knowledge management. Secondly, as a conclusion, the brief assessment of Europe 2020 Strategy will explore the significance of innovation and investment in R&D to the ''*Smart, Sustainable and Inclusive Growth*".

Every battle has its strategy, and every battle has to be won. ''Strategic approach means understanding of deep analysis of main trends of growth, forecasting and predicting possible change in different courses, defining priorities as well as defining the possible solutions. Furthermore the strategic approach signifies the new combination of resources in which the dominance is on the side of non-material resources (information and knowledge)", asserts Dragan Djuricin.[1]

Companies and consequently nations by Michael Porter achieve competitive advantage through constant innovation including both new technologies and new ways of thinking and doing things.[2] ''As the basis of competition has shifted more and more to the creation and assimilation of knowledge, the role of the nation has grown" describes Porter.

In the new innovation era that is technology driven, the most developed societies invest in research and human capital development. Also, following the ''Europe 2020 Strategy" consisted of political and economic reforms set up in order to enforce the EU by investing in people, focusing mainly on employment, education and training, social inclusion and social cohesion the European society proves how much it strives for technological innovations.

### Information and Technology Driven Society

The birth period of the New Economy was in the last decade of the 20th century. Officially and on an institutional level we may give the origins of New Economy in some precise dates.[3] The first one is the Meeting of the Open market Federal Committee (Federal Reserve, USA) from the 20th December 1994 when the act of a longer (4 years) coexistence of a high growth rate and low inflation rate was adopted. The other official occasion that certainly may be used as a beginning of the New Economy is the day when Netscape was quoted on the New York Stock exchange, on 8th August 1995. The same goes for the launch of the World Wide Web which effectively marked the birth of Internet as a mass tool and

1 D Djuricin, *Srbija 2012: Vizija razvoja i strategija konkurentnosti*, in Kopaonik Biznis Forum Zbornik Radova, 2006, p.11
2 Michael E. Porter, *The Competitive Advantage of Nations,* paragraphed in Economics Module, required reading material for Master in State Management & Humanitarian Affairs, University of Sarajevo, 2003; Porter has developed the theory and its implications for government policy and company strategy, as well as future prospects for nation economies.
3 C Felice &N Mattoscio, *New Economy, Dall'homo faber, all'homo sapiens*, p.9-13, FrancoAngeli, 2005.

consequently augmented the productivity of the economy. Then, Netscape was founded in spring 1994, and Netday came of existence in California on the 4th March 1996 when US President Clinton regulated on telephone cables installations in order to give access to schools to log onto the Internet. In 1996 Microsoft launched Internet Explorer.

Bearing in mind the birth of today's economy, allows us to think that the New Economy should also be called Net Economy or ICT (Information and Communication Technology) Economy. Moreover it is actually based on advanced technologies and depends on them.

It is accepted that the New Economy is a true revolution of structure itself in world economy. Furthermore, it allows the power of the lowest in the organizational structure as F Rampini would say ''potere dal basso".[4] The separation of the worker and entrepreneur, producer and consumer, vendor and buyer tends to become more and more fragile and indistinct. Contrapositions are disappearing. The new organizational structure of companies is developed on the principles of Knowledge Management.

It is important to exclaim that the New Economy does not represent one fragment of economy, it is the economy as a whole and it plays decisively according to the legislation and fundamentals different to the Old Economy; it is based on the principles of contemporary paradigm, and not only on economics and finance. The New Economy is a symbol of a New World, New Age driven by the knowledge. Not only the production, distribution or finance have changed, but the culture, human relations, lifestyle, and whole society took another dimension of a new way of living. New technologies and internet entered in every segment of society. In politics democracy became electronic as debates and decisions are made on a large scale through Internet. In medicine, science and new technologies made life longer and illness detected much faster. Nevertheless, some new illnesses occurred such as Internet Addiction Disorder or Net dependency.[5]

And it goes far beyond. For instance it is enough to insert a small chip under the skin and humans can be controlled and followed everywhere at any time. It certainly changes our perceptions and the world overall.

**Industrial Economy vs. Knowledge Economy**

Since the new, knowledge driven economy quickly changed our society, the best way to understand the change and plan the future is to assess what happened. The change is constant and the only predictable factor.

Neo-classical economics recognized only two factors of production: labor and capital. This is now changing. Capital and energy are being replaced by information and knowledge. Furthermore, technological changes transformed the industry in terms of physical force transformation into knowledge based work force that creates wealth. Information, global work force, knowledge and expertise are mobile, transferable and transported instantaneously over the globe. This increased mobility of information, technology and knowledge are the key factors of production. Share of knowledge increases competition and companies' competitive advantages can be eliminated overnight. The only comparative advantage a company will enjoy will be its process of innovation-combining market and technology

4 F Rampini, *New economy. Una rivoluzione in corso*, cited in C Felice &N Mattoscio, *New Economy, Dall'homo faber, all'homo sapiens*, FrancoAngeli, 2005.

5 In the summer 1999 American Psychological Association released that 11 millions Internet users (6% of total) had suffered from some form of Psychic dependency from the World Wide Web . Felice & Mattoscio, op.cit., p.21.

know-how with the creative talents of knowledge-workers to solve a constant stream of competitive problems and its ability to derive value from information.

Three forces are driving the New Economy: Knowledge, Change, and Globalization.[6] In a continuous, fast, and complex change of economies driven by innovation our future is unpredictable and generates uncertainty. Intellectual capital has become a strategic factor and people make strategic decisions and take actions for the companies or states based on a certain set of understanding called knowledge. When trading globally, all the research and development, technology, production and information is accessible to everyone, everywhere, anytime. This produced global hyper-competition and interdependency of businesses that generated the need for knowledge and innovation. The cause was rapid growth of the World Wide Web that made almost anything available to anyone, anywhere and anytime. That's why the knowledge is spread internationally and instantly and this means more competition for everything everywhere. Knowledge has become new battlefield for countries, corporations and individuals.

New rules are driving the development of the New Economy such as speed, new business models, lots of technology and information, low entry barriers, and ferocious competition.

In the following tables the old economy will be compared to the new one on three determinants (market, work force and enterprise). Even though, the New Economy has been characterized already in the above text, the tables will show the main differences between two economies.

**1) Market**

| ISSUE | INDUSTRIAL ECONOMY | KNOWLEDGE ECONOMY |
|---|---|---|
| Economic development | Steady and linear, predictable | Volatile- extremely fast change with explosive upsurges and sudden downturns; chaotic- the direction of the economy's changes is not perfectly clear |
| Market changes | Slow and linear | Fast and unpredictable |
| Lifecycle of products and technologies | Long | Short |
| Key economy drivers | Large industrial firms | Innovative entrepreneurial knowledge based firms |
| Scope of competition | Local | Global hyper competition |
| Competition: Name of the game | Size: the big eats the small | Speed: The fast eats the slow |
| Marketing: Name of the game | Mass marketing | Differentiation |

**2) Work Force**

| ISSUE | INDUSTRIAL ECONOMY | KNOWLEDGE ECONOMY |
|---|---|---|
| Leadership | Vertical | Shared: employee empowerment & self-leadership |

6 Vadim Kotelnikov, *New Economy, Key Features of the New Rapidly Globalizing and Changing Knowledge Economy*, retrieved February 2005, <http://www.1000ventures.com/business_guide/crosscuttings/new_economy_transition.html>

| | | |
|---|---|---|
| Work force characteristics | Mainly male, high proportion of semi skilled or unskilled | No gender bias, high proportion of graduates |
| Skills | Mono skilled, standardized | Multi skilled, flexible |
| Education requirements | A skill or a degree | Continuous learning |
| Management-employee relations | Confrontation | Cooperation, teamwork |
| Employment | Stable | Affected by market opportunity |
| Employee seen as | Expense | Investment |

**3) Enterprise**

| ISSUE | INDUSTRIAL ECONOMY | KNOWLEDGE ECONOMY |
|---|---|---|
| Pace of business | Slow | Appreciably faster with ever rising customer expectations |
| Emphasis on | Stability | Change management |
| Business development approach | Strategy pyramid: vision, mission, goals, action plans | Opportunity driven, dynamic strategy |
| Success measure | Profit | Market capitalization |
| Organization of production | Mass production | Flexible and lean production |
| Key drivers to growth | Capital | Resources: people, knowledge, capabilities |
| Key sources of innovation | Research | Research, systemic innovation, knowledge management, integration, venture strategies and business models |
| Key technology main sources of competitive advantage drivers | Automation and mechanization | ICT, e-business, computerized design and manufacturing |
| Main sources of competitive advantage | Access to raw materials, cheap labor and capital for conversion, cost reduction through economies of scale | Distinctive capabilities: institutional excellence, moving with speed, human resources, customer partnership, differentiation and competitive strategies |
| Scarce resource | Financial capital | Human capital |
| Decision making | Vertical | Distributed |
| Innovation process | Periodic, linear | Continuous, systemic |
| Production focus | Internal process | Entire value chain |
| Strategic alliances with other firms | Rare, 'go alone' mindset | Teaming up to add complementary resources |
| Organizational structure | Hierarchical, bureaucratic, functional, pyramid structure | Interconnected subsystems, flexible, employee empowerment, flat structure |
| Business model | Traditional: command and control | New, refocused on people, knowledge and coherence |

*Table 1: Industrial Vs Knowledge Economy*

*Source: Vadim Kotelnikov, New Economy, Key Features of the New Rapidly Globalizing and Changing Knowledge Economy*

While the industrial economy was characterized by the large companies that created a steady and secure business environment, the knowledge economy is driven by the innovative entrepreneurships that adapt easily to rapid technological changes. The change in the new economy market is constant and we can deduct from Table 1.1. that the most competitive companies are those that are fast as opposed to large. Just as companies did, people became more flexible, multi-skilled and knowledge oriented in order to retain lifetime employability. On the contrary, in the industrial economy employment was stable and life-long with low education requirements. The new economy invests in human capital and develops teamwork, which further changed the organizational structure in order to adapt to continuous change. The structure is faster, more flexible, focused on people and the sharing of knowledge, rather than on command, control and the restriction of information. The bureaucratic model has been replaced with flat structure and decision-making became distributed to a line management.

**Innovation Era**

As mentioned previously, the digital revolution brought a new economy on all levels: political, cultural, social, etc. That revolution still changes the story of humanity itself and the new civil era. And it brings various manipulations of genetics, so-called bio-digital convergences that we face today when listening about cloning.

Partly enabled by changes in economy, the nature of consumer and business demand is also changing. These changes are summed up in the concept of a 'knowledge economy', where constant innovation and flexible products and services are leading the market. Competition is more intense, and the potential opportunity more rewarding as the marketplace is now global.

The collapse of communism and the spread of Internet have radically altered societies and economies throughout the developing world and civil societies. Private sector and civil society institutions are rapidly evolving in countries in transition.

Matti Pohjola describes that Information and communication technology (ICT) enhances the economic growth and then assesses the impacts of the use and production of ICT on economic growth in a number of industrial countries.[7] In his research it is revealed that about two-thirds of the improvement in US labor productivity can be attributed to ICT, but also argued that in other G7 countries outside United States, the contributions to output growth from the use of ICT is less than half of the contributions estimated for the US. In particular, the given example of Finland which is one of the leading European producers in ICT, showed no acceleration in the trend rate of labor productivity. That drives us to evaluate strengths of the New Economy from other determinants that are part of the New Age. The productivity gains do not only reflect increased investment in ICT but also complementary innovations in business organization and strategy. The success of software industry has increased the relative value of professional workers, not only programmers, but also managers and analysts.

This growing importance of human capital has lead to new, innovative models of organization and management driven by the knowledge.

7 M Pohjola, *The New Economy: Facts, Impacts and Policies*, World Institute for Development Economic Research (WIDER) United Nations, p.9, retrieved January 2005, <www.wider.unu.edu/publications/other-publications/pohjola-journal-article-2002-1.pdf>

**Knowledge Management driven from Technology**

''Technology is a key enabler of the knowledge driven economy. It is the power tool of its construction. Technology underpins the tools and processes needed to support a knowledge economy and its fundamental to process and product innovation across all industries and government. But benefits will not be achieved unless technology is implemented with the necessary complementary skills and understandings of change of management process."[8]

Some organizations contribute to their failure by ignoring the ways in which knowledge based company should communicate with its employees. It is not enough to invest in new technologies if the business performance and knowledge management are not adopted. Collaboration, sharing knowledge and building on each other's ideas should develop a new organizational company culture. One of the key factors for the higher return on investment and enhanced productivity of labor is certainly the effective utilization of technology.

Brian Arthur, Dean of Economics and Population Studies at Stanford and author of *Increasing Returns and Path Dependence in the Economy*, suggests that the new world of knowledge-based business is characterized by "re-everything" involving continuous redefinition of organizational goals, purposes, and its "way of doing things." [9]

Knowledge management is about how organizations measure, share and make use of intangible assets. Organizations have always managed knowledge, even if they did not use the term knowledge management. Knowledge management practices, like new technology, have spread massively across the whole economy.

''Knowledge Management caters to the critical issues of organizational adaptation, survival and competence in face of increasingly discontinuous environmental change. Essentially, it embodies organizational processes that seek synergistic combination of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings."[10]

However, there is a wide spread confusion between `knowledge' and `information' which has caused many managers to invest in technology ventures that have yielded marginal results. Many professors and magazines of knowledge highlighted the need for constructive conflict in organizations that aspire to be leaders in innovation and creation of new knowledge. The key factor in success is contended to be in human beings and that the knowledge creation occurs in the process of social interaction.

**What does Europe strive for by 2020?**

Europe 2020 Strategy has set up three priorities when the investments related to knowledge based societies development is concerned:

1. Smart growth – to develop knowledge and innovation based economy
2. Sustainable growth – to promote a more resource efficient, greener and more competitive economy.

8 Intellect Response to the Trade and Industry Select Committee, *Progress Towards a Knowledge Driven Economy,* paragraph 24, 28 November 2003, retrieved January 2005, <www.intellectuk.org/download.asp?file=390>

9 W. Brian Arthur**,** *Increasing Returns and the Two Worlds of Business*, Harvard Business Review, July-August, 1996, retrieved January 2005, <www.santafe.edu/arthur/Papers/Pdf_files/HBR.pdf>

10 Yogesh Malhotra, *Deciphering the Knowledge Management Hype,* The Journal for Quality & Participation, July/August 1998 (Special issue on Knowledge Management) cited in *Knowledge Management for the New World of Business* © Copyright, 1998, All Rights Reserved, retrieved March 2005, <www.brint.com/km/whatis.htm>

3. Inclusive growth – to foster a high-employment economy delivering economic, social and territorial cohesion.[11]

The European Union has a target of investing 3% of GDP in Research & Development.

The focus is on both the public and private sectors to invest in R&D and on digital society capacity building. Since Europe is falling behind on high-speed Internet, it consequently diminishes the innovation, and share of knowledge and ideas that are on-line mediated. On line dissemination of information and knowledge will improve education and training systems and benefit the economic outcomes of knowledge digital based society. This concerns countries in EU, as well as candidate countries.

Organizational change is a must. It is not enough to adopt high speed Internet and not to share the ideas and knowledge. It is not enough to stimulate innovation in SMEs sector without investing in knowledge management capacity building.

Several building blocks are needed for the transformation of the regional economies: investment in research and innovation, knowledge and information infrastructures, education, training, support to creative industries and new managerial work structures pivotal in encouraging smart growth.[12]

Use of knowledge and information is essential and the whole knowledge based economy is founded on that principle. Investments in human capital, primarily in the field of education and innovation are of core essence if states and companies tend to grow smartly.

Before considering any kind of expansion, we need the infrastructure to be in place. It is the foundation upon which a house is built, upon which companies, corporations and national economies grow. The infrastructure can be defined as training, management development, technology, communication, and flow of information systems. Infrastructure, i.e. the foundation, has three parts: people, things (processes, sites, equipment, vehicles…) and money. And if an organization plans to expand and grow, it has to be prepared in advantage and to plan for growth, having already the infrastructure ready.

**European Organizational Learning (The Bologna Process in practice)**

The learning organization is an organization that adopts and implements organizational learning through a process of creating, acquiring and using knowledge and competencies in order to achieve a competitive advantage. Thus, it is important to explain the concept of organizational learning. Bearing in mind that the individual learning defined by J Greenberg and R. A Baron, is a process in which constant change in individual behavior appears due to experience and new knowledge gained, M Petkovic deducts that the organizational learning is a constant process of change that will bring promotions, innovations, improvements in productivity and other sectors as a result of experience and new knowledge that the organization acquired.[13]

In contrast to individual learning, organizational learning involves a social dimension. The process of learning through social interaction between members of an organization

11 Europe 2020 growth strategy, p.10, retrieved July 2015, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF - page 10

12 RCC, retrieved July 2015, http://www.rcc.int/pages/67/education-and-innovation

13 M Petkovic, N Janicijevic & B Bogicevic, *Organizacija, Teorija, Dizajn, Ponašanje, Promene,* Ekonomski fakultet Beograd, 2002., p.447.

creates a range of potential individual and collective behaviors.[14] This is explained through applications of new rules and practices (routines) that regulate the organization in the whole.

Who actually learns? Pedlar defines the learning organization as one that facilitates learning of all its members and continually transforms itself. [15] Garvin asserts that the learning organization considers new knowledge that gives solutions on how the work is to be accomplished.[16] Peter Senge defines learning organizations as ''organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together." [17] Organizations, in fact, learn only through individuals who learn, asserts Peter Senge, arguing also that individual learning does not guarantee organizational learning. However, it is clear that without individual learning, there is no organizational learning.

Knowledge conversion takes place when people share, externalize, combine and internalize their knowledge in the so called ''exploration"[18].

Organizational learning is characterized by its culture and structure. Janicijevic gives a definition of Corporate Culture: ''Organizational culture is a system of assumptions, beliefs, values and norms of behavior that organization's members developed or adopted through common experience and which influences their opinion and behavior."[19]

N. Janicijevic also affirms that the purpose of organizational learning is to gain competitive advantage on the market, based on the superior routines as core competencies. However, those routines can generate inflexibility of the organization concerning change over time. Consequently, new models of organizational structure with knowledge intensity are appearing: less rigid, smaller, flatter, temporary, horizontal, circular, open and networked, etc.

Furthermore, recent developments within this sector showed that the workplace became a campus. Attracting and retaining the best people call for their training and continuous investment in their career in forms of corporate universities developed in an organization.

Changing educational needs will produce changing educational institutions, and there are many beliefs that corporate universities are a threat to higher education. ''Universities won't survive. The future is outside the traditional campus, outside the traditional classroom. Distance learning is coming up fast" says Peter Drucker.[20] Learning will not stop. It is life-long, and is expanded in a work place. With the development of new technologies and constant change of environment the old distinction between learning, working and living disappeared.

Traditional universities will indisputably change their model, if they plan to survive. Let us assess two possible scenarios of future development of educational institutions that I took the liberty forecasting:

14 J Child *Organization: Contemporary principles and practices,* Blackwell, Oxford, 2005, cited in N Janicijevic, 2006.
15 E McKenna & N Beech, 2002., p. 240.
16 B Bogicevic, *Menadzment ljudskih resursa,* Centar za izdavacku delatnost Ekonomskog fakulteta u Beogradu, 2004., p.174.
17 Peter Senge *The Fifth Discipline: The Art and Practice of The Learning Organization*, 1990, retrieved May 2006, < http://www.infed.org/thinkers/senge.htm>
18 Nonaka & Takeuchi, 1995, cited in N Bontis & C Wei Choo, 2002.
19 N Janicijevic, *Organizaciona kultura, Kolektivni um preduzeća*, Ekonomski fakultet Beograd, 2002, p. 391.
20 Cited in J Ridderstrale & Nordstrom, 2002, p. 228.

1) Traditional universities will become steady partners of corporate universities. This would enhance the exchange of knowledge in favor of both parties. Universities will teach professionals and corporations as people, and the corporations will be able to use all the fruits from the academic and scientific research.

2) Traditional universities will further shorten the study period and programs, consequently becoming much less specialized (one form of dying) which will evoke a birth of a new university model (something between corporate and traditional university). For example, this could induce student internship into something different. Internship extended in terms of time and enriched with practical theories (student attending corporate university classes) would acquire a particular degree relevant to the specialization obtained.

The relation between universities and companies had already proven to be effective and will grow closer and closer. The new, more flexible university system already introduced some important modifications in the relation between universities and companies and Universities started on numerous collaboration projects at international level.

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