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NEW TECHNOLOGIES GENERATE NEED FOR A NEW ORGANIZATIONAL PRACTICE

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Abstract: *The paper reflects on development of new technologies and mentality of its developers. Authors have selected important technologies which shape future life style. Each of selected technologies has specific characteristics which require different mentality of own developers. New ways of thinking and acting are necessary for different type of education. Today we are living in the period when science strongly produces new knowledge that is simultaneously translated into in new technologies. The speed of creating new technologies increases permanently, whereas the speed of change management lags behind the technology development. Because of this, it is important that management is innovated, i.e. that management processes are reengineered. Development of new technologies has marked number of evolutionary steps that different industries have made. Once competitors have reached similar level of technological advancement, exploration of new drivers of differentiation and competitiveness entered a "soft orbit". Companies started paying additional attention to innovation and talents. Therefore authors underline the connection between selected technologies, new ways of thinking and development of more adequate organizational practice, and human resources management that support it.*

Keywords: *new technologies, management of technology development, organizational practice, human resources management*

INTRODUCTION

John Naisbitt was right to say that every stone thrown into the water make waves, as every new technology does. New technologies make waves which should be recognized by the consequences introduced and if those are wanted by the human kind. Directions of technology development are changing in relation to overall society level of knowledge. Present civilization is at new, higher level of restructuring, where people and institutions are getting into new roles. Such role and mission are coming from something that Naisbitt simply defined. [1]

Technical understanding and artist' creativity… It's of high importance to balance – high technology and high art.

Some scientists share his opinion. One of them, physicists and mathematician Stephan Douplii names his own creative work as poetphysic or poe$_{fly}$physics [2] and says… Poetry, a supernova of feelings. Physic, a supernova of ideas. New strings of letters, a new string of mathematical symbols are the two sides of the Moon, an alien Enary… History of science informs us that some of the developments are made of art of mathematics (e.g. James Clerk Maxwell – electromagnetic radiation/radio waves, Paul Dirac – antimatter), while for many other developments, wide comprehension was required (e.g. Warner Heisenberg – uncertainty principle). Certainly some scientists like Douplii interested in super symmetry and non commutative structures in mathematics and physics, had different mental approach then those scientists engaged with problems based in tangible world around us.

The need to create different ways of expressing thinking is an outcome of recent developments of science and technology, which is nowadays defined as technoscience. The Technoscience is complex phenomenon which is at the same time science,

scientific technology and technological science [3] A product of technoscience is not only an understanding of nature and of its phenomena, but that also necessitates and provides the capability to create phenomena and design ways to control and manipulate them, or technoscientific process embodies the dialectic between the two trajectories of the science–technology relationship: science-driven technology and technology-driven science. Besides, we also can notice increased pace of developments of trans-disciplinary sciences as for instance biomechatronics. Such sciences and derivate technologies require different model of thinking, with expressed holistic approach and process judgment.

Within the paper we are exploring some of modern technologies with an aim to detect its characteristics which are shaping mentality of people engaged in their development, and especially those who manage these processes.

PROBLEM FORMULATION

Ervin Laszlo notes that human brain functions as quant computer and raises the question what such revolutionary discovery on human brain capacity means for the future of human kind [4]. Quantum consciousness – QC is the type of consciousness to which human being accesses when it uses potentials of quant-computerized brain. The brain is a macroscopic quant system, although it's used as exclusive classic biochemical system. At quant functioning, the brain receives not only information collected by sensor organs (eyes, ears, skin) but also those from wider environment where humans are networked – non local connections. Modern civilization has undermined such human capacity. The author is at the stand that the next phase of development will be actually on this segment of consciousness and will save human kind. Why? Because: the quant consciousness is immediate, intuitive and linked with environment. It inspires empathy towards people, nature, brings an experience of openness and belonging. Not only that the QC makes people more accountable towards other people and the Planet, it also initiates them to fight collectively with the problems. The most of people cooperate with members of their family and society, while cooperation and relations at global level are of vital importance. Without aligned acting the human kind would hard respond to emerging problems and threats. Without an aligned acting there is a risk of extinctions as many species unable to adapt to changed circumstances. Although that request for global cooperation is necessary at this stage of civilization development, seems that people are not yet ready for it.

The need for different type of approach, as well different technology development is noticeable indirectly through analyses of science classification. If compared The Frascati Manual (Organization for Economic Co-operation and Development) 2002 and 2007 edition, it's visible that ethics emerges around many of science disciplines (e.g. ethics in medical biotechnology or ethics in agricultural biotechnology), which suggests on many areas of co-acting [5].

On the other side, philosophers of science pay more attention to evolutionary psychology which has developed on basis of sociobiology [6]. The evolutionary psychology as an alternative research programme, which yet needs to position own status, aims to establish close relations between evolution and social sciences.

Therefore it suggests new model of social science – Integrated Causal Model, which is based on human capabilities such as learning of symbolic languages, understanding and concluding, comprehension of material worlds, anticipation, organization of social life, reproduction and food selection, recognizing faces in order to resolve complex tasks. Supporters of such model consider that traditional social sciences have not succeeded due to limited respect towards biological dimensions of human existence. Social sciences should therefore be based on the theory of evolution. By linking human behavior which is subject of social sciences and evolution, as biological discipline, there would be a bridge created for deeper understanding of creative work and quant consciousness, and we would be able to design programmes of higher probability to ignite common acting with a consciousness that everything is interlinked.

Within the paper we begin from the presented point in an attempt to further develop this theme. The authors consider there is a relation between development of new technologies and mentality of

its' developers. As the new technologies are based at new science findings which are mainly beyond direct comprehension of senses or techno science, the authors recognize that managers needs to pay an additional attention to human resources management. They need to understand specific mental modalities of people who develop new technologies and to change existing management and business systems of technology development. In theory and practice of technology management there is still limited attention to mentality of technology developers.

In order to be able to change the process of technology development based on new approach towards human resources management, there is a need to change educational system, especially in higher educations. It should be based on support of creativity, development of emotional intelligence, and comprehension that everything is interconnected as a basic principle of sustainable development.

PROBLEM SOLUTION

Nanotechnologies

Nanotechnologies are closely related to nano science, therefore N&N. The N&N are at initial phase of development. It's considered that development pathway of nanotechnologies has passed 4 phases, e.g. there are 4 generations of nano technologies [7]. Products of the first generation are commercialized, the second generation is still in laboratories, and the third and fourth generations are under experiments. The most advances N&N are named molecular manufacturing – M&M. Development of such complex products will be based on positioned and controlled mechanical and chemical managed systems of the molecular machines. The power of the M&M lays with possibility to use devices called personal nanofactory, which could be placed at any working surface, supported by miniature chemical process, computer or robot and could produce range of products. The N&N would not only produce high quality products at reasonable low price and high pace yet would generate new factories producing under high quality and low price. Such unique ability to generate owns production capacities are the reasons that nanotechnologies are called exponential technologies. The N&N are increasingly more linked with Bionics and create new, unlimited possibilities.

Characteristics of the N&N – the acronym itself describes strong ties between the science and technology in simultaneous process of development. Secondly, many of science disciplines are embedded within the N&N (molecular physics, science on materials, chemistry, biology, computer science, electro engineering, etc.) so that development depends on the pace of integration of different knowledge under range of disciplines. The integration of disciplines requires cooperation competence at the same time.

Consequences to mentality – there will be an enormous discontinuity which would manifest at the interruption of the present social system. Such change would not remain within the borders of the develop world. Therefore Intuitive Linear View [8] should be abandoned. New mentality would need to manager terms like frog jump and exponential growth. Such mentality needs to remain open and confident, as this can manage fear from new or unknown, which is specific to people. The fear from new can be noted at scientist which consider that M&M is just a science fiction. However, none of them is active in the N&N but chemistry, physics, biotechnology, etc. Max Planck has noted long ago that realization of new ideas goes only with new people, not with persuasion on validity of such new ideas. Vision of the N&N future requires discussion on Social and Ethical Issues – SEI. As that the role of the N&N is not fully defined, discussion programme could be clearly defined also [9]. Key for understanding of the N&N is that these are technologies of wide opportunities for improvements of existing processes and that will leads towards industrial revolution.

Industrial ecology and ecodesign

Industrial ecology and ecodesign could also be considered as integration of science and technology. Contrary to the N&N, industrial ecology and ecodesign would not generate developments of high intensity, but changes of high wide intensity. Industrial ecology as the science of physical, chemical and biological interactions and inter relations within and between industrial systems and its surroundings [10] or could be

considered as a science on sustainability [11]. One of the key objectives of the industrial ecology is change of industrial systems from linear to circular systems. Such change requires new tools. One of these is Life Cycle Assessment – LCA, which considers evaluation of environment burden based on industrial processes, products or activities. The other tool is Life Cycle Design – LCD and Design for the Environment – DfE which considers that during the phase of design, principles of sustainable environment are projected into final design. In such manner the innovations and design became potential for regeneration of environment, cultural and society as an added value product, for clients, business and society [12].

Characteristics of Industrial ecology and ecodesign – Introduction of ecodesign is looking of solutions within the design process at two directions – bottom-up and top-down. The top-down entry is wide and includes academic research, environmental expertise, access to research knowledge, application of developed tools, etc. The bottom-up entry is coming from industrial reality and from managers. These two directions are frequently conflicting, so the development process itself could be looked from the perspective of optimization of conflicting objectives.

Consequences to mentality. Industrial ecology has brought debate on education, or more specifically, where it would be though – independently or incorporated within other disciplines. Whatever solution prevails, it's certain that those, whom develop technology in alignment with industrial ecology, should possess holistic approach to problem solving. Additionally, due to potentially conflicting objectives, they should develop specific value system which would contain moral, ethics and integrity. At this stage, researches from range of R&D sectors demonstrate different sensibility towards usefulness and strategic interest of ecodesign. There is also high level of suspicion towards new methodology based on fear from additional expectations. Additionally, industrial ecology and ecodesign have underlined needs for new range of process thinking. Every phase of development demands specific implementation principle of the environment protection, which implies that ecodesign cannot focus on just specific phase of product development but to be involved in all phases under different arrangements and strategic values delivered for each of phases.

Neuroeconomics: Brain and Business

Neuroeconomics science has evolved from the need to better understand humans in order to define ways for coping with business environment influenced by new technologies and new techniques required for leading and developing organizations. Carmen Nobel, a senior editor of Harvard Business School Working Knowledge, has become attract with fact that economists have been paying increasing attention to how the brain works [13]. Though, a neuroscientist and a business school might seem an odd fit, the research of Christine Looser on how people brain detects aliveness and the possible implications for organizations is being carefully observed by the business world.

The field of neuroeconomics has gained ground in the past 10 years, with exploring the brain activity that influence decision-making processes. Additionally, there is a fast-growing field of neuromarketing, which uses brain-tracking tools to find out why consumers prefer some products over others; and neuroleadership that relate neuroscience to management research. With her research, Looser is trying to integrate insights from social psychology, neuroscience, and business, and want to understand how we interact with other people. If we think about this, it's surprisingly hard to come up with any business transaction you can do alone. But Looser sees practical applications as well. At Harvard, she is conducting research to determine whether we're more likely to retain and remember information—data and objects—if the information is followed with a picture of a human face. Such information would help marketers to create more memorable product advertisements and executives to design presentations that are really attached with their customers, clients, and employees. From one side, there is a possibility that the human face may be distracting, so we will lose the thing but remember the face; but the other possibility, which appear to be more likely, is that seeing a human face will give us entrée to advanced cognitive mechanisms, that will encode things more deeply because they're paired with a face. Looser also plans to study whether our brains

get overloaded in the presence of too many faces, which may yield insight into the effects of a crowded office; or how to test how much energy we lose by being around large crowds; and is there a way to be around a crowd of people in such a way that it doesn't feel draining. There are a lot of open questions that psychology and neuroscience can help answer. And this can have a real impact on the way organizations build relationships with employees, stakeholders, and shareholders.

NEW KNOWLEDGE

In this new fast changing world shaped with new technologies, economic growth, business success and global stability will increasingly depend on the creation of new mind set. 21st century economy need leaders with a mind set that understand, interact, and use new technologies; that support and participate in the evolution of those technologies; and are able to transfer that knowledge. Those leaders are capable to understand emerging trends and positively respond to the major challenges associated with the knowledge society. In the emerging knowledge society which is expanding in both rich and poor countries, significant focus must be placed on:

1. *cybercitizenship, e.g. democratization and massification of connectivity and digital access; and*
2. *building new forms of socioeconomic, entrepreneurial and governance organization where innovation and talent leadership play a key role.*

In this new context, the path towards development becomes ever more complex and demanding. Development of the new technologies and the consequent globalization of the economy generate huge changes, disruptions and challenges regarding the current ways of producing, consuming and living, cultural pressures as well as a growing international competitiveness. This all have positive and negative consequences. Though, such changes, at economic and social level may initiate feelings of loss, crisis, disappointment and denial, they may also give rise to a global and positive vision, focused on a promising future with new opportunities at all levels: economic, social, cultural and political. In this environment colored with uncertainty, the difference between positive and negative approaches lies on:

1. *understanding major emerging trends and being able to meet the challenges of the knowledge society consisting of creation of new technologies; and*
2. *the existence and quality of adequate leadership; mobilizing and inspiring leaders oriented towards socially and economically sustainable results.*

There is a wide consensus on the fact that knowledge has become the key resource of the 21st century's economy. The arrival of the knowledge society and increasing influence of new technologies implies major changes for organizations. Today, it is estimated that 70 to 80 percent of economic growth in OECD countries is due to new and better knowledge.

Knowledge has value, but so too does knowledge about knowledge. The key issue knows how to create and to capture that value. However, good practice of the leading global organizations is showing that the creation of value lies essentially in talent and innovation management; and to be able to capture created value depends much more on the reinforced practice of strategic leadership rather than on the implementation of rigid procedural and organizational control systems. Leadership that energizes ideas and emotions in favor of high performance becomes therefore the most decisive organizational process. Leaders with new mind set, create magnetic fields which motivate, develop and mobilize results-oriented talent rather than just managing the status quo.

From the micro level (organizational), the new organizational context requires a new type of leadership oriented towards unlocking the talent of others. It is talent, and the imagination and innovation associated with it, that forms the soul of successful organizations. This is why, an effective leader has to be, above all, a talent facilitator, along with three key components:

- *intellectual capital (creative and rational),*
- *emotional capital (capacity to work with others), and*
- *social capital (value of knowledge network).*

Looking from the macro level (economies), countries should focus more on employment and

talent attraction and development strategies than on industrial strategies. For example, productive delocalization resulted from the knowledge economy, allows countries to more easily change the specialization pattern of their economies, namely through technological modernization. It also enables to create new economic sectors (activities), such as the Information and Communication Technologies (ICT), particularly in value chain segments at worldwide level, where geographically disintermediated services (telework) may be delivered in a more competitive way.

Apart from that, the dramatical situations happen at universities, those very institutions where knowledge is being created and disseminated. In the USA, the most developed world country; the 1980 Bayh-Dole Act and 1986 Federal Technology Act are being accepted. In those acts the profit-making out of intellectual property is being enabled, whereas the commercialization of the university knowledge spreads up faster and has intensified.

Knowledge is evaluated, above all, on the basis of the share in creating product and processes for the recently-created markets, i.e. the markets that will be created in close future. Today we are living in the period when science strongly produces new knowledge that is simultaneously translated into in new technologies. The speed of creating new technologies increases permanently, whereas the speed of change management lags behind the technology development. Because of this, it is important that management is innovated, i.e. that management processes are reengineered.

Creation of new mind set call for the education that integrates science and technology, and incorporate all aspects influencing economical and social environment. This may become foundation for nurturing people educated to understand, design, develop, innovate, and inspire continuous creation of new knowledge and new technologies that will simultaneously evolve with the economical, technological, and social evolution.

Needs for new organizational practice

Development of new technologies has marked number of evolutionary steps that different industries have made. Examples of such transformation are well known and documented – we are clear on development pathways, driving forces and enablers which helped change. Once competitors have reached similar level of technological advancement, exploration of new drivers of differentiation and competitiveness entered a "soft orbit". Companies started paying additional attention to innovation and talents over the last 20 years – these were recognized as the "War for talent".

Although successful companies focus were in developing human capital and innovation strategies, return of such investments was not always coming quickly enough to keep the competitiveness in a comfort zone and new explorations were launched to look beyond existing transformational arsenal. Companies have to remain mobile and agile in search for its future structure (Survivors are the most adaptive, not the most advanced – C. Darwin). This invites for continuous transformations against and beyond known and predictable trends. However capable thinkers we can have in our organizations, pace and speed of developments and increasing number of variables which could place an impact to the organization, require additional stretch and organization learning in no-traditional manner.

However, new chapter in the book of organizational development goes into direction of cross-industry sharing of best practices, which are driving the need to remain competitive and demonstrate organizational ability to convert and develop own future. Getting a license for existence and stakeholders support simply means remaining agile, flexible and driven at the path of constant improvement. Phase of self-reinvention cannot generate required level of change and competitiveness, and small, gradual self-paced improvements in own business models within an industry should be replaced by cross-industry learning and clever transfer of successful business models. Such companies are open to listen and watch others and are actively exploring beyond the industry fence. Richard Brenson of Virgin has a simple look over such process - "I have no regrets trying to break the mould and taking a different approach. That has resulted in Virgin being one of the best known brands in the world".

Regardless of the industry in focus, if an organization would look at range of other industries there are perhaps dozens of examples and ideas which could be copied. Yet, simple copying would bring the risk of inapplicability. Therefore "smart copying" is actually relaying on extrapolation of successful examples under your organization operational circumstances and framework.

Having sad that, the pathway could look too easy, and too simple. We could say that many businesses across different industries face similar issues and similar business functions. Common roles which should be interchangeable are in finance, planning, human resources and sales. But in each of those functions there is something in other industries which could be beneficial and add value to your practices, processes, standards and business model.

New competencies for new HR

Inevitably, organizational agenda based on learning for development requires investment in human resources and introduction of new standards for workers in 21st century. These skills cut across industries, functions and actual job titles, presenting a new golden standard. As this implies new thresholds for self-development, it equally well informs students or aspirants in career development on areas for improvement, either through education, on-job learning or exposure in circumstance which enable required development.

We consider that critical set includes:

- ***Adaptability skills** – critical thinking and problem solving, time management, flexibility and lifelong learning. Workers which are fixed to their job description, rigid and slow in adapting would face serious difficulties in remaining competitive in ever-changing labor market;*
- ***Information management and communication** – ability to quickly and selectively collect data, analyze, understand, and select information of critical importance and impact for transfer into forms appropriate for range of potential audiences. Cultural sensitivity and effective negotiation are of additional importance;*
- ***Business skills** – finance and project management, matrix and network management, as well as product marketing and management;*
- ***Science, technology, engineering and math (STEM)** – advance knowledge of STEM and quick adaptability to new requirements followed with capacity to immediately apply;*
- ***Interdisciplinary skills** – combining technical skills with business acumen.*

In order to maximize advantage from cross-industry learning, organization has to have capacity to absorb new knowledge and flexibility to quickly adapt to the new procedures/practices. This is where the power of HR lays. The HR function creates tangible value in organizations by focusing primarily on delivery of HR practices (staffing, development, compensation, labor relations, etc.), based on professional and often research-based principles. These practices are important, and research indicates that when they are done well they add tangible value to the organization. However, professional practices alone do not systematically address the increasing sophistication and importance of talent markets and decisions to today's competitive challenges. HR department should develop own competencies required for molding and shaping talents. The new HR role is to know:

- *how to create the innovative profile of an organization;*
- *how to stimulate creative experience and actions;*
- *how to increase employee satisfaction rate (because this is in close relationship with the attraction and retention of employees);*
- *how to control the workforce stability (this represents the biggest threat to intellectual capital drain, since unwanted departure of best performing employees and talents significantly influence competitiveness of the organization),*
- *how to attract and retain experienced employees that create new approaches, services, products or processes based on their experience, etc.*

In addition of investment in in-house talents and promoting vertical development, organizations can opt for double win – recruiting talents from other

industries. If properly targeted and carefully deployed within the organizations, talents could provide many benefits for new employer – strategic mindset, unique skills, fresh perspective, innovation, new visions and then invigorate present management structures and decision making. At the same time they need to learn new industry intricacies, business complexity and driving forces in order to properly utilize their previous experience, expertise and skills. Again, if done just in too bluntly manner, staff takeover can harm organizational performance. So the mastery is not just in making a copy-paste, but doing this in a way that adds value to the operational and organizational context – well thought on benefits, systematically planned, culturally and value-sensitive, and with clear transformational objectives. In order to succeed, cross-industry talents must possess a number of specific characteristics, like:

- *ability to interact at all levels, including back-of-the house employees;*
- *excellent relationship builder;*
- *superb communication skills and a great active listener;*
- *passion for new industry, customer service and the team;*
- *ability to drive change while respecting the past.*

CONCLUSION

Based on the presented, there is undoubted need for the new education that integrates science, technology, engineering and mathematics.

Engineering allows students to understand the design. They develop understanding of the attributes of design, engineering design, the importance of problem solving, research and development, invention and innovation, and experimentation in problem solving.

Mathematics encourages creativity. Technology is viewed through the four stages of the process: design, construction, implementation and production. And, science develops scientifically spirit and knowledge. Science is part of the culture. It is impossible to understand the science and appreciate the history, society and language of the people who create. Science and technology are no socially and morally neutral categories. They are the activities of the man and society for society.

New and a wonderful knowledge that every day inspire innovation and diffusion of ICT is responsible for irreversible changes in business processes, e.g. electronic commerce, communicating via video conferences, employees personal ICT equipment that allows direct access to the business processes, etc. In an environment that continually shifts business practices, employers' requirements are transforming. Companies are looking for authentic people, that quickly adapt and change, enjoying the volatility, and nurturing their talents and creativity. Continuing advances in information and communications technology have made possible new forms of international coordination within global companies and potential new ways for them to cultivate in these fast-growing markets. There are many individual success stories, but, generally, organizations are still struggling to adapt. The ICT is clearly one of the major influences undoubtedly impacting organizational environment, and calling for more adequate management, learning methodology and leadership styles.

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