The European Proceedings of
Social & Behavioural Sciences
EpSBS

Future Academy

ISSN: 2357-1330

http://dx.doi.org/10.15405/epsbs.2018.02.2

RPTSS 2017
International Conference on Research Paradigms Transformation in Social Sciences

NEURO-TECHNOLOGIES FOR KNOWLEDGE TRANSFER AND EXPERIENCE COMMUNICATION

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Abstract

The training and education systems can utilise the neuro-web and neuro-technologies for communicating and transferring knowledge and competencies and for correcting problems in the reality' reflection, perception and understanding. The advantage of neuro-communications is built on the capacity to detect directly individuals' perverse behaviours or attitudes, and to influence directly the emotions, feelings or sensations. The implementation of the neuro-technologies for the educational purposes permits one to adapt the process of getting and applying knowledge and skills with a higher level of individualization and concretization. Understood in this wide sense, the education or training process is similar to the socialisation, the knowledge and experience transfer concerns any situations of learning, as well everyday situations in the organisational or economic behaviour, in professional growth and in the social construction of networks of cultural activities. This paper aims to contribute to the analysis of the neuro-technologies within the knowledge transfer through the conceptual study of the potential ways of the neural networks' implementation to exchange the skills and competences and to communicate the experience of a student towards a teacher, taking into account that in different moments any of the roles can be played by the actors.

The purpose of this conceptual analysis is to structure the approaches of the neuro-communications and to configure the ethical vision of the potential, carrying out the neuro-research, in cognitive economics or in the knowledge transfer.

Keywords: Knowledge transfer, education, experience communication, competencies sharing, neural networks, neurotechnology.

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1. Introduction

100% solutions in the field of neuro-communications can and will be utilized by the education, which implies not only fundamental theories' teaching, but also developing skills of the latest technologies in modern formats. Transformations in the educational sector are driven by new technologies and innovative social practices that spread through modern societies (Global Education Futures Forum, 2016). M. Mead' (1970) notion of the pre-figurative cultural transmission describes the situation, when the elder generations are studying from the younger ones, especially in the field of the up-to-date high-tech gadget use. Besides, the neuro-communications are able to facilitate this transfer of practical experience. There are several spheres of most vital applications of neuro-technologies for education:

1.1. Productive state-of-mind training (e.g. highly focused state or ability to relax in stressful environments), attention management, and working with subliminal signals & sensations

Modern companies are interested in applying meditation practice to enhance productivity due to information overload and ADHD syndrome. Google has created the Institute of leadership programs 'Search Inside Yourself', which offers a special training course for engineers to help employees effectively cope with stress at work and increase their productivity (Analysis… RVC, 2015).

1.2. Objectification of evaluation and assessment of educational process and its outcomes

The ability to objectively assess the educational process (student involvement, interest, emotional well-being) and its results by a set of psychophysiological parameters allows determining how ongoing activity involves learners and adapting the educational content to fit in the learners' requirements. Biometric data can be one of the parameters of educational statistics, which can be used to tailor training courses to the current mental state of the learner (Global Education Futures Forum, 2016).

1.3. Senile dysfunctions treatment and 'Brain fitness'.

Practical software solutions and biofeedback wearables help to develop cognitive skills and cope with age-related dysfunctions of the nervous system (e.g. Alzheimer's and Parkinson's diseases). The industry of "brain fitness" software applications and technology solutions for the development of various cognitive abilities (memory, mental arithmetic, pattern recognition, etc.) is currently estimated in $ 5 billion. (Sharp Brains, 2012).

1.4. Psychopharmacological support of the learning process and nootropics

This includes the potential of personalized medicine and drugs personalization, based on gene testing to improve body and mind abilities. According to some researchers, the resource psychopharmacology was severely underestimated by the modern educational system, and legal psychoactive substances can become one of the most important educational tools aimed at strengthening the skills and capabilities of a healthy person, prompting creativity and other cognitive functions to improve their academic results (The Guardian, 2009).

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2. Problem Statement

Knowledge Transfer, as an essential ingredient for innovation and enterprise development, drives to a competitive and thriving knowledge economy. Over the past several years, government reports and policy have highlighted the importance of Knowledge Transfer from universities for social and economic benefit (Cruickshank, Mather, Evans, 2010).

Knowledge Transfer can be considered as a supporting (and a secondary) educational process, whereas practices of here-and-now collaboration between senior and junior community members will become essential to education. The cyber-economy creates the new conditions and substantial contexts for the communicative strategies and knowledge transfer, making the challenge more complex to align the influences of virtual agents. Even with the virtual space opportunities, the connections between people and companies can be closer due to the geographic factor that explains the development of clustering processes (Pokrovskaia & Wei, 2017). The enhancing of clusters development reflects the insufficiency of the existing cyber-space for the efficient communication (Gruzelier & Egner, 2004).

2.1.Knowledge economy concept

The introduced term of knowledge economy (Machlup, 1962) or knowledge-driven economy (Temple, 1999), or knowledge-based one (Harris, 2001), takes into account the phenomenon of codified information overload (Toffler, 1970) and of the necessity to understand, what is the real return from this abundance of data and what is the use of knowledge. The information society concept reveals the new role of the national and institutional leaders in the intellectual activity. The knowledge economy includes the creation of intellectual products or weightless assets (Quah, 1997), the spread of knowledge, the controlling and managing processes of knowledge transfer, and at least, the implementation of knowledge. The new actors gained dominance within the economic and social structure (David & Foray, 2002); the key role is played by the regulation of transfer of knowledge through the education system or within organizational learning.

2.2.Connectedness, networking and integration for prosperity

The macro-economic regulation is related to the analysis of the connection between the national economic growth and the knowledge networking system (DTI, 1998). The internal connectedness within national economy (UNIDO, 2015) and external integration into global digital economy raise some deep concerns about the regulatory mechanisms, the real societal function of the business and entrepreneurship and the place of personality' self-development and actualization within the value scale.

The expansion of knowledge dominance and the life-long learning are the two components of the evolution of human society within the era of neural networks, artificial intelligence, total digitalization, smart spaces and internet of things and of everything. The central functional role within the knowledge economy is played by the research, the scientific labs and academic institutions.

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2.3.Macro-economic analysis of growth' drivers

The educational system' efficiency for the national economic growth was proven in 1995 (Barro & Sala-i-Martin, 1995), when the study demonstrated the impact of the higher education on growth, and was extended and deepened in 2012-2013 (Eichengreen, Park, Shin, 2013), when the statistical data' analysis allowed one to study the determinants that influence the average growth rate of per capita GDP and the risk of national States to experience the slowdowns that occur at several levels of the GDP per capita (middle-income trap). The analysis of the trap determinants' showed the significant role of the higher education and human capital which are helpful to avoid the trap.

2.4.Innovative economy and technologies evolution

The transition from resource-based (Solow, 1978) and factor-driven (Abramovitz & David, 1996) economy toward the model of innovation-driven (Koh, 2005) economy is based on the technological changes and the capacity of nations, firms or individuals to be in advance.

The approach of Industry 4.0 adds to this analysis the networking and connectedness effect, including the German governmental project (BMBF, 2016) and the Japanese Connected Factories programme for monodzukuri as a specific Japanese harmonious sustainable manufacturing style (Toyota's Monozukuri, 2012) with a highest quality and unique competence.

2.5. Knowledge management and knowledge measuring

The management issues for knowledge transfer are based on the possibility to set goals and to assess their achievement that needs a clear system of criteria. The financial gauge of the knowledge management success should be presented in the different horizons of measuring, taking into account the short-term and long-term evaluation of results (Foray & Gault, 2003). The profit-driven business is oriented to the return' maximization and creates the new competitive or collaborative business strategies, new flexible structures and communicative policies through sophisticated branding and creating symbolic universes, the internal trust and the external architecture of networks (Kay, 1999).

The problem is related to the necessity of a systemic understanding of the knowledge transfer models, the digital economy, and the total connectedness (through the internet of things, the neuro-technologies and the industry 4.0.) raises the need for structuring the ethical and regulatory concerns taking into account the human and social awareness.

3. Research Questions

The changes that the educational system undergoes nowadays are driven primarily by development of digital technologies, healthcare, and finance. This article examines the impact of the seminal design of neuro-communication on the educational system and knowledge transfer. This analysis reflects a wide range of experience culled from educational experiments that one observed, took part in or initiated oneself. Strong vertical learning structures transmitting knowledge from teachers to students such as universities give way to horizontal learning and exchanging of knowledge & experiences via communities of practice.

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3.1.High-road competition and human capital investment

The economy of knowledge is based on the personal development. There are, at least, two questions to discuss – the financial measuring of human flourishing, and the real role of the infrastructure for everyday life and work as a key investment to attract human capital to a local or regional economy.

3.2.The connectedness and digital environment as factors for human capital

The return on investment in human capital is based on the funding directed to the educational and health-care local systems and on the attractiveness of the place for talented and high-qualified people who are educated abroad. The digital infrastructure and the neural technologies will play, in fact, two roles:

- To transfer experience and knowledge through the neural technologies and communications,
- To involve the new actors into the local, regional or institutional networks, the artificial intelligence systems and neuron communication and exchange as an infrastructure for the potential future development.

The smart spaces and smart objects produce opportunities for a personality development from humanistic and economic points of view – for goal setting within a value scale of a society, and for accomplishing with a higher level of efficiency, by transforming the philosophy of sense into financial measurement and economic logic of return on investment.

3.3.The theoretical analysis of the conceptual research questions

The questions arisen in this paper concern the following possibilities of the neural technologies:

- to transfer the cognitive map to many people (millions or billions of persons) (a);
- to acquire the experience, i.e., within the educational process for planes' pilots (b);
- to assure a safe experimentation of the different behaviour or negotiating models within sandboxing mechanisms (c);
- to communicate the emotions, feelings and perceptions from one individual to another (e.g., in advertising or in educational process) and to create the tacit knowledge without the explicit one, bypassing the effortful process of transformation from conscious incompetence through the conscious competence into the unconscious competence (d).

The practical implementation within the educational programs, the enterprises' learning centers and through the public system of supporting knowledge transfer requires the understanding of the constraints and limitations, of the correct and socially responsible sustainable goal setting.

4. Purpose of the Study

The phenomenon of codified and tacit knowledge transfer through the neural communication technologies requires conceptual interpretation. The purpose of the research is the understanding of the core principles that lie in the basis of the knowledge transfer regulation through the neuro-technologies.

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4.1.Ethical concerns

The human existence and self-actualization in creative labour raise the question of the replacing humans by machines. The humans' functional role is oriented to control and to correct the decisions made by robots and ICT tools'. The social role of people involved is the goal setting in conformity with the values and ethics, the essential cultural norms and the humankind sense making.

4.2.Instrumental measuring

The investment into the information treatment raises the questions of the potential return and of the essential factors that influence the profit rate. This financial motivation led to the search of the managerial possibilities to develop the criteria of successful management and to measure the results.

5. Research Methods

The conceptual research concerns the analysis of the existing theoretical approaches toward the neuro-communication, applied to the knowledge transfer, oriented to the construction of typology of neural tools for competencies exchange and sharing experience by the criteria of 1) age, 2) professional implication into making decision process, creative activity, regulation and responsibilities, 3) the entrepreneurial personality as psychological types preferring to behave in a risky environment or uncertainty.

The theoretical study uses the Weberian ideal-type' method for the typological analysis, system and comparative approaches as the basic methodology for understanding individuals' behaviour within the process of the knowledge and competencies transfer and experience communication.

6. Findings

The concept of human capital, related to the investment logics, is in contradiction to the creation of intellectual products and the transfer model of knowledge, to economy principles of ethics and experience. The data transfer is organized in an efficient way by the technological means, but the creation of the content and the new vision of the previous situation can not be yet accomplished even by the intelligent things and even by the Internet of things.

The collision between the very deep roots of the psychology of human behavioural models, constructed on the basis of a concrete representative system (cultural, religious, ideological, etc.), with the profit-oriented maximizing function led to the breaking out of the struggles and battles, including the cyber-attacks and terrorism. The problematic field of the physical and psychological, emotional and intellectual security is enrooted in the communication failures on the macro- and micro- levels.

The communication is the core process in the economy of knowledge and experience. The communicative skills determine the adequate perception of the interlocutor. With up-to-date development of the virtual space, the abilities of negotiating are transformed into a specific set of competencies of communicating using different technologies, gadgets and smart devices. Neuro-communications for the knowledge transfer will provide wider dissemination and take-up of research findings in terms of both

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policy and innovation. Integrated interdisciplinary approaches, combining theory and novel technology-based experiments for understanding higher-level cognitive functions (such as motivation and reward, memory, decision making, emotion, interaction, communication), can be the following:

6.1. Games & simulators, development of personal education management systems as an answer to demand for personalized education from employers and investors

Development of personalized education tools, combined with psychotherapy, will be embedded into the process of the life-long self-development.

6.2. Emergence of a new communicative environment such as Neuro-web using the protocols of brain-brain interface

In order to solve non-trivial problems in uncertain environments and under time pressure, the team will use digital co-working environments and 'live knowledge' models supported by artificial intelligence. Such methods to improve group effectiveness as Appreciative Inquiry Summit, World Café, Future Search, "Dynamic facilitation, Developmental facilitation, Search Conference, Work-Out, Real Time Strategic Change, etc. create collective vision for the internal structures in relation to the external environment.

6.3. Virtual reality

The use of virtual reality technology is the most attractive in the education area. In 2015, the Russian game "Developer Nival" has presented the educational Inmind project based on virtual reality technology. Using OculusRift helmet, the user can travel inside the brain of a patient to monitor the communications of neurons and to search for the affected cells.

The emergence of NeuroWeb will create a problem of 'Global Psychodivide', a partition of society into those who are ready to enter the new communication environment and to face its benefits and side effects, and those who will resist it. If NeuroWeb become the reality, it will mean the end of teaching & learning as we know it, and the emergence of new forms of education & training that will be created specifically for 'neural collectives' and superfast network learning. It is clear that the concept of learning itself will be embowered by the concept of co-development

Currently, the products and services of the market of neuroeducation are developing rapidly in such promising segments as distance learning, lifelong learning, massive open online courses, blended learning, and innovative models of supplementary education.

Table 01. Possible directions of neuroeducation development

2015	2016-2020	2020-2035
Existing products /services	Developing products / prototypes	Forecast
Distance learning Learning through life Additional education	Neuro-helmets for virtual reality and virtual simulation systems. Brain-computer interfaces for education. Elements of hybrid intelligence in research and teaching.	Education accelerated techniques using brain-computer interfaces. Full use of hybrid intelligence for solving various problems in the national economy (2035)

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Priorities are allocated to the creation of educational and laboratory areas for students based on Neurotechnology experiences, optimized memory and enhancing cognitive functions, and by 2035, full use of integrated systems of natural and artificial intelligence is expected.

7. Conclusion

A wide bulk of punctual studies of the neuro-communication includes marketing and finance fields: analysis of the impact of different visual, audial or textual tools on the perception of a message; analysis of the influence of different signals on the financial or purchase' decisions. The conceptual understanding of the influence of the virtual or augmented reality is usually based on the broad socio-cultural or psychological reasoning on the change of the post-modern individuals' brain functioning and consciousness.

The authors emphasize the regulative dichotomy of the technical or human tools and goal setting for the neural networks' evolution. The experience and competence transfer by the use of neuron-technologies can be understood from the viewpoint of the privacy; this studying position rises some questions on the regulation, especially, controlling and censuring regulative mechanisms inside neural networking.

The application of the results of this conceptual research can have the following outcomes:

- the typology as an analytical grid for further understanding of neural technologies implementation and as a framework to cover the lacks and to overtake the ruptures in the neural technologies and neural science, cognitive social sciences and experimental studies, such as behavioral economics, humanistic psychology or gestalt-therapy; neuro-education;
- the theoretical anticipation of vertical and horizontal innovations within the techniques of knowledge and experience transfer by the neuron technologies and through the neural networks; the new modeling of value chains and new products and services within the virtual reality or with the use of augmented reality;
- the ground built for the corporate HRM tools and for the development of different forms of professional growth, the prediction for dawn-shifting practices, the team-building within virtual reality' space, the construction of structural forms or knowledge flows in companies;
- the practical recommendations for improving the public administrative governance of evolution of the educational system needs a serious substantiation, taking into account the "Google doctrine" of the advancing technical design that significantly outstrips regulative bodies, etc.

The research issues and ethical and managerial statements are helpful to improve the regulatory system for the machine learning and smart space's expansion within human and social requirements.

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