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## NEURO(MANAGEMENT) THROUGH THE PRISM OF BRAIN RESEARCH

The main thesis of this article is contained in a statement that application of neuroscience in human resources management is a good direction towards more effective use of employee potential. Nowadays neuroscience has become interdisciplinary with professionals that represent different disciplines cooperating to study a complex human organ – the brain. They strive to explain the processes underlying thinking, feelings, emotions, and decision-making. Technological change has led to the emergence of several important neuroimaging methods that provide us with answers to classic questions asked in human resources management, in particular as regards people's motives in making decisions and choice, especially in terms of acquiring competence (i.e., motivation to learn). The sources of various types of information on motivation are various areas of the brain, while linking information and directing motivation to the right path (according to the brain) happens predominantly in the medial prefrontal cortex. This article presents the selected research findings obtained through neuroimaging and their influence on changes in organisation management, especially as regards human resources, as well as information on the potential of neurotransmitters stimulating motivation. In the second part of the article, the author presents an author's model of adult learning based on the assumptions of neuroscience, which emerged in consequence of a two-year process of Design Thinking – from idea to innovation (i.e., a ready product) through pre-incubation stages to incubation (during which prototypes were tested on a research group).

**Keywords:** neuroscience, neurotransmitters, human resources management, motivation to act.

### 1. INTRODUCTION

Development of brain imaging methods is an achievement of medicine, which is adopted in numerous other sciences, including management. Researchers, managers, and business trainers (including the author of the article herself) show increasing courage to use brain research results disseminated by neurobiologists in order to verify the possibility of adopting these findings to predict and account for organisational processes, especially to monitor human behaviours. Neuromanagement tools may be considered as very effective provided they are not used un-ethically. Long-term experience of the author as an educator has inclined her to look into this matter and enabled to put forward a hypothesis that orga-

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nizational management through relations and emotions, especially human resources management, will become a norm and will be determining the development of such an organizational culture.

In line with the above, it is the objective of the article to demonstrate that application of neuroscience in human resources management is a good direction towards more effective use of employee potential.

The gaps in the brain research lead us to focus on specific areas, and motivation is one of them, maybe the most important one. By referring to one of the selected areas of human resources management, that is, motivation, the author addresses (through Design Thinking) a question about a real possibility of generating, the so called, external adult motivation in life and through life – approach. Taking into consideration brain research, observations made on the contemporary labour market (nowadays called the employee market), and the author's Learning Model determining individual motivation levels, the author puts forward another hypothesis that Tayloristic approach to management, which claims that the character of a job is unimportant to an employee as long as he or she receives appropriate remuneration, does not conform to the reality. The theories of motivation, which have been developing since the mid-20th century, have demonstrated that organisations are not only sources of income for employees but also a place where they seek satisfaction of such needs as development or acceptance.

## 2. NEW DIMENSION OF (NEURO) MANAGEMENT

There is a mutual interrelationship between the way we think and the way we act. Appreciation of this interrelationship may help create new ways of organizing<sup>2</sup>. Studying a live brain opens up new possibilities for uncovering the secrets of this body organ – it is a way of learning about human thoughts and behaviours. The first non-invasive methods were popularized in the second half of the 20th century. They include: electroencephalography (EEG); computed tomography (CAT and CT); positron emission tomography (PET and SPECT), magnetic resonance imaging (MRI), and functional magnetic resonance imaging (fMRI). The following are considered the newest methods: magnetoencephalography (MEG), transcranial magnetic stimulation (TMS), and single neuron imaging (SNI)<sup>3</sup>.

In practice, this translates into neural-level accounting for findings produced by research that uses methods relevant for social sciences. Furthermore, brain imaging tools also allow to frame completely new research questions and receive answers to these questions within the area of management as well.

Professor R. Bagozzi, one of the most influential marketing researchers and a world-class expert in management science, says the following about this new trend: "I see neuroscience as complementary to social and management sciences. (...) neuroscience offers possibilities for verifying classic theories of social sciences, may overthrow false theories and, generally, helps us gain a better understanding of how the brain works so that we can better explain, predict, and control human actions. Obviously, this knowledge may be used to (...)

<sup>2</sup> G. Morgan G., *Images of Organization*, Warszawa 1997, p. 395.

<sup>3</sup> Ch. Fritz, *From Brain to Mind. How is Our Inner World Formed*, Warszawa 2011, p. 18–27; P. Jaśkowski, *Cognitive Neuroscience: How Brain Creates Mind*, Warszawa 2009, p. 42–77; S.M. Kosslyn, R.S. Rosenberg, *Psychology: Brain. Human. The World*, Kraków 2006, p. 133–138.

support the government, companies or other institutions in decision making since it is concerned with social, organizational, and welfare-related matters”<sup>4</sup>.

### 2.1. Decision Making Process

In the context of management, this knowledge is mostly adopted in the decision making process during, e.g., purchase/sales; selection of a strategy of operation – cooperation/competition; employment of a candidate or not – in the recruitment process; or the use of punishment and prize for employee motivation. In order to study the functioning of individual parts of the brain during making decisions, various games are used, which examine neuron activity of individual players depending on decisions made by players themselves or by other players as well as on observations of behaviours displayed by other game players.

The decision making process is based on the evaluation of the value (benefits) arising from taking action and on the assessment of the likelihood of receiving the benefits. Both these evaluations are more or less subjective in character. This means that the rationale they are based on is not fully verifiable in objective terms before a decision is made or in the course of making a decision. This is because they are concerned with the future considered exclusively through the prism of assessment of likelihood<sup>5</sup>.

Neuroscience is a collective name for a relatively new, interdisciplinary discipline of science focused on studying the central nervous system and so, essentially, the brain. Neuroscience owes its specific character and the resultant dynamic development (since the 90s of the 20th century) to drawing and using conclusions from the relevant achievements of numerous exact sciences (mainly biology, biophysics, and biochemistry) and human sciences (including psychology, anthropology, linguistics, etc.). The effect of these interdisciplinary studies are new disciplines of brain sciences, that is, the particular areas of neuroscience<sup>6</sup>.

Contemporary development aids in exploring other disciplines of science. Currently, neuroeconomics and neuromarketing are gaining popularity and neuroscience is also discussed with regard to its influence on the understanding of the mechanisms behind managing employees or a company (i.e., neuromanagement)<sup>7</sup>. Neuroeconomics<sup>8</sup> is an interdisciplinary discipline combining neuroscience, psychology, and economics for the purpose of developing a common decision making theory. According to the definition of Tomasz Zaleśkiewicz<sup>9</sup>, “it is a discipline of science that studies neuronal correlates of decisions and

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<sup>4</sup> B.J. Tkaczyk, *Richard Bagozzi: Neuroscience and Management. Interview with Professor Richard Bagozzi*, 2010, [http://manager.inwestycje.pl/nauka\\_manager/Richard-Bagozzi-neuronauki-i-zarzadzanie;110949;0.html](http://manager.inwestycje.pl/nauka_manager/Richard-Bagozzi-neuronauki-i-zarzadzanie;110949;0.html), (accessed on 20 July 2018).

<sup>5</sup> J. Kozielski J., *Psychological Theory of Decision*, Warszawa 1977, p. 148, 203.

<sup>6</sup> B. Jamka, *Neuroscience versus Stimulation of Entrepreneurship: the Potential Hidden in Hemispheric Specialization, Neurotransmitters, and Brain Plasticity* in: M. Kosała, M. Urbaniec, A. Żur (eds.), *Contemporary Dilemmas in Research on Entrepreneurship*, Vol. 2, No. 1, Kraków 2016, p. 16.

<sup>7</sup> Q. Ma, X. Wang, *From Neuroeconomics and Neuromarketing to Neuromanagement*, „Journal of Industrial Engineering and Engineering Management” 2006, Vol. 20, No. 3, p. 129–132.

<sup>8</sup> Its fundamental premise is based on human mind activity as a derivative of the activity of neurons located in the brain. Hence the discipline has been given another name – neuroscience of decision making.

<sup>9</sup> T. Zaleśkiewicz, Z. Piskorz, *Brain, Mind. Decisions. Neurobiology of Not Only Subjective Probability* [in:] *Psychology of the Mind*, Z. Piskorz, T. Zaleśkiewicz (eds.), Gdańsk 2003, p. 446.

economic evaluations with the use of methods such as: functional magnetic resonance, electroencephalography, positron emission tomography, psychophysiological response measurement, and neurological patient studies.”

The discoveries of neuroscience have caused the business world to express interest in human emotionality and the advertising sector took the lead in this respect. Advertising agencies were the first ones to understand how much they can gain, if they make the consumer love the brand they are creating. And so the discipline of neuromarketing has emerged, which chiefly comprises three areas: development of classic marketing studies, support for communication of a message in line with the knowledge provided by neuroscience, and the use of techniques offered by cognitive neuroscience to analyse and support sales. (...) the main focus in neuromarketing<sup>10</sup> is the policy of communication since reactions of the brain are measured in relation to specific external stimuli (e.g., a commercial)<sup>11</sup>.

Another subdiscipline of neuromanagement is neuroleadership. The term itself was introduced by D. Rock and J. Schwartz<sup>12</sup>. Knowledge on brain activity may offer explanation of human behaviour. It can help managers to more effectively match employees to duties and simultaneously manage different projects. As far as employees are concerned, it may allow to increase efficiency and avoid professional burnout.

### 3. NEUROMANAGEMENT OF HUMAN RESOURCES

In the context managing humans, knowledge on how the human brain works may aid in creating an organizational system (i.e., culture) that will positively affect increasing employee engagement (including motivation) with respect to performing duties as well as in building and developing interpersonal relationships in a company.

Nowadays the human factor in a company is most commonly seen as/called a resource and increasingly – a capital, while rarely – as if within a niche – a potential<sup>13</sup>, which is highly diversified on top of that<sup>14</sup>. Decision making is one of the most frequent and important human behaviours. But is it a favourite one? Decision making is a process involving numerous lower-level processes connected with the operation of many brain areas<sup>15</sup>. However, it is believed that the prefrontal cortex plays the main role in these processes and their coordination<sup>16</sup>. Decisions that exert direct influence on the human being in their

<sup>10</sup> It is more and more common for market analysts to examine thinking processes, feelings, and customer preferences in the context of using various persuasion techniques and marketing tools encouraging to make a purchase.

<sup>11</sup> A. Wawrzyniak, B. Wąsikowska, *Neuroimaging Methods in Research on Decision-Making in Management*, “Organizacja i Kierowanie” 2016, No. 1, p. 57.

<sup>12</sup> D. Rock, J. Schwartz, *The Neuroscience od Leadership*, 2006, <https://www.strategy-business.com/article/06207?gko=6da0a> (accessed on 10 July 2018).

<sup>13</sup> B. Jamka, *Neuroscience versus Stimulation...*, p. 55.

<sup>14</sup> M. Kłos, *Neuroscience – Perspectives for the Development of Human Resources Management?*, “Marketing i Rynek” 3/2016, p. 362.

<sup>15</sup> D. Lee, M.F. Rushworth, M.E. Walton, M. Watanabe, M. Sakagami, *Functional specialization of the primate frontal cortex during decision making*. *The Journal of Neuroscience*, 2007, August 1, p. 27, 8170–8173.

<sup>16</sup> D. Krawczyk, *Contributions of the Prefrontal Cortex to the Neural Basis of Human Decision Making*, “Neuroscience and Biobehavioral Reviews” 2002, 26, p. 631–664.

personal space are concerned with employment planning, selection and pursuance of a path of development as well as assessment, and motivation. Research within the discipline of neuroscience makes it possible to gain an increasingly better understanding of the essence of thinking processes that give rise to certain human behaviours and ways of making decisions. Kahneman described these two thinking modes as<sup>17</sup>:

- system 1 (fast thinking): acting quickly and automatically; without effort or with little effort; without the sense of conscious control; encompassing intuitive thinking (professional and heuristic) and automatic forms of thinking activity (e.g., perception, memory); its core is associative memory.
- system 2 (slow thinking): requires focused attention; it is activated when system 1 does not know the answer to a question, which requires, e.g., complicated calculations, or if some task is contradictory to the model of reality built in the mind; it allocates necessary attention to tasks that require mental effort and is responsible for constant monitoring of behaviours (e.g., control of emotions); its activity is connected with a subjective sense of concentration, free choice, and conscious action.

The distinction between the modes of thinking is important in regard of competences (characteristic qualities) that employers desire to see in employees and candidates (which are required and verified in the course of recruitment and selection). Organizing, planning, and creative skills require conscious thinking, whereas culturally (or environmentally) ingrained values/skills determine quick thinking and automatic actions. Some research results reveal physiological processes underlying various degrees of arousal. Numerous such observations were made by A. Arnsten<sup>18</sup>, who has studied prefrontal cortex for many years by way of reaching to the level of neurons, synapses, and neurotransmitters. The researcher has established that the correct functioning of the synapses<sup>19</sup> in the very cortex depends on the appropriate level of neurotransmitters present in the neurons: dopamine and noradrenaline.

Human brain chemistry changes throughout the day in response to stimuli from the environment. Noradrenaline is chemistry of alertness and dopamine is the chemistry of interest. In order to achieve an appropriate level of arousal, the right level of both these chemical compounds is necessary. Dopamine level increases when the orbitofrontal cortex detects something new or unexpected<sup>20</sup>. The brain produces more dopamine, if a person is expecting a positive event to happen, that is, something perceived as a prize. This mechanism plays a key role in learning various things (i.e., acquiring competence); and a human being links positive experiences with positive social contacts since we have always been learning within a community and cooperation is most likely the biggest enhancer<sup>21</sup>. These conclusions may significantly contribute to accounting for how people motivate others thus questioning the legitimacy of defining “external motivation”.

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<sup>17</sup> D. Kahneman, *Thinking Traps. About Fast and Slow Thinking*, Poznań 2012, p. 31–32.

<sup>18</sup> A. Arnsten, *The biology of being frazzled*, “Science” 280, 1998, p. 1711–1712.

<sup>19</sup> A synapse, which is a gap between neurons, receives and sends impulses.

<sup>20</sup> D. Rock, *Your Brain in Action*, Poznań 2015, p. 89.

<sup>21</sup> M. Spitzer, *How the Brain Learns*, Warszawa 2012, p. 137.

#### 4. NEUROTRANSMITTER VERSUS MOTIVATION TO TAKE ACTION (INCLUDING TO LEARN)

The issue of human motivation still arouses interest. Many publications on this topic have been emerging for years, while researchers and business practitioners wonder what makes people willing or unwilling to work. What does the newest research have to say about this? Is it possible to motivate a person at all?

Studies carried out in recent years almost consistently indicate that non-financial motivating factors take the lead: 1. appreciation of employee's work and achievements; 2. development opportunities (for acquiring higher qualifications); 3. friendly working atmosphere<sup>22</sup>. If employers have such knowledge why do so many things still work poorly? The results of brain research offer answers regarding the essence of motivation to learn and perform tasks, which should attract employers' and employees' interest.

The brain is a network of connected nerve fibres and synapses that an electric signal travels through. Its speed and quality are controlled by neurotransmitters (i.e., chemical substances) – that are released internally<sup>23</sup>. One of them, called the “interest chemistry”, is dopamine whose level increases when the orbitofrontal cortex detects something new or unexpected. The brain produces more dopamine, if a person is expecting a positive event to happen, that is, something perceived as a prize<sup>24</sup>. This may explain why an employee concentrating on a thought that if they do well in their job they will receive a prize may obtain an optimum level of the neurotransmitter. Sequences of behaviours or events that have led to a result better than expected are processed further and there is a greater probability that they will be remembered. Thus the learning process occurs and it takes place each time we experience something positive<sup>25</sup>. Contemporary knowledge on the brain and its activity in response to learning, prize, and punishment in a way takes the opposite stand with respect to questions on producing motivation (referred to as external motivation) by indicating the existence of rather demotivating campaigns (e.g. praising the best ones who do not really have a problem with motivation).

#### 5. LEARNING BASED ON BRAIN-FRIENDLY METHODS – AN AUTHOR'S CASE STUDY

Interest in neuroscience as well as a desire to examine the area of adult motivation to take up new tasks have caused a 4-people team<sup>26</sup> to create a social innovation. Its objective was to create, test, and implement an effective and innovative method of learning for adult people. The team has worked for about 2 years with the iterative method – Design Thinking<sup>27</sup>, from idea to innovation (i.e., a ready product), through pre-incubation stages to in-

<sup>22</sup> *Ibidem*.

<sup>23</sup> D. Eagleman, *Incognito Brain. Civil War in Your Head*, Warszawa, 2012, p. 275.

<sup>24</sup> D. Rock, *Your Brain in Action...*, p. 89.

<sup>25</sup> M. Spitzer, *How the Brain...*, p. 145.

<sup>26</sup> A multidisciplinary team is characteristic for Design Thinking: 1 doctor of management sciences (and author of the article), 1 doctor of human sciences (and a special educational needs teacher), 1 doctor of pedagogics specialising in pedeutology, and 1 doctor of health care sciences.

<sup>27</sup> Design thinking is a method of creative problem-solving, which was defined for the first time in the United States in the 60s. Its purpose is to provide innovative solutions through the adoption of

cubation, and through short and dynamic stages preceded by research and drawing conclusions to working on another prototype. Each of the 3 prototypes was tested by a target group selected randomly. The innovation was a response to the problems defined as follows: adults' poor learning abilities (arising from the stigma of traditional education based on lecturing and brain-unfriendly methods); unwillingness to learn due to the existence of stereotypes (e.g. the brain stops learning with age) and experiences with ineffective learning<sup>28</sup>. In a pilot study conducted on a sample of 80 people, it turned out that knowledge on effective learning techniques based on neurobiological bases is scarce. Sixty per cent of the respondents were not able to name and enumerate brain-friendly methods of learning<sup>29</sup> and myths about brain activity hindered them in achieving better effects in terms of self-development. Forty-five per cent of the respondents were convinced that there was no need for them to train due to the current professional situation and few were aware that training is necessary in all age groups<sup>30</sup>. Nearly 50% of the adults showed no engagement in acquiring knowledge and skills or unwillingness to finish the activity they have already taken up owing to little progress or faith in their own abilities (including a language course or classes teaching how to play a musical instrument). Brain studies demonstrate that an adult human being may learn effectively, while lack of regular intellectual effort reduces possibilities. As far as memorizing tasks are concerned (e.g., memorizing words), in older adults the prefrontal areas were more active, which is a phenomenon referred to as poster-anterior shift in ageing (PASA)<sup>31</sup>. Studies such as these are carried out with the above-mentioned fMRI method and show that the efficiency and speed of processing information decreases with age thus the brain needs to make use of more areas in order to achieve comparable results.

Research carried out by the project team as well as its members' training experience show that adults want to know why they should be learning, they need to learn through experience, and approach learning like problem-solving (i.e., learning through practice). They learn the most when the subject constitutes an immediate value for them. The study confirmed 4 main "motivators" indicated by M. Knowles<sup>32</sup>. First of all, success – adults want to be successful in learning; secondly, willingness-people want to have a sense of having influence over learning; thirdly, value – adults want to feel that they are learning something worthwhile; and fourthly, pleasure – they expect learning to be a source of pleasure.

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specific methods stimulating creativity. All actions are later transposed to a business scheme. Design thinking is based on project thinking intended to produce creative solutions.

<sup>28</sup> In relative terms, the most intense non-formal educational activity was displayed by people aged 25–44 as over a fourth of this group declared having entered this form of education. As far as the youngest respondents (aged 18–24) are concerned, 22.1% of this group were receiving this type of education. One may notice a downward trend in educational activity which is decreasing with the respondents' age (from 21.4% learners aged 45–49 to 7.4% learners aged 60–69) (Central Statistical Office, 2016).

<sup>29</sup> In this article, the term brain-friendly refers to methods based on methodology drawing upon the available scientific knowledge on the brain.

<sup>30</sup> cf.: A. Szczucka, K. Turek, B. Worek, *Polska Agencja Rozwoju Przedsiębiorczości*, Warszawa 2012, *Adult Learning, HR Investment in Companies, and Training Institutions*.

<sup>31</sup> S.W. Davis et al., *Que PASA? The posterior-anterior shift in ageing*, *Cereb Cortex*, New York 2008, No. 18(5), p. 1201.

<sup>32</sup> M.S. Knowles, E.F. Holton III., R.A. Swanson (eds.), *Adult Education*, Warszawa 2009, p. 107 and further.

As mentioned above, the respondents were hardly able to enumerate learning techniques based on brain research but they had no problem identifying the factors that determine their willingness to learn. These were: minimizing the message (i.e., limitation of content and time to an absolute minimum), aesthetics of the content/materials (e.g., appropriate colour scheme, font), attractiveness of the technique (e.g., interactive elements, animations), and comfort of use (e.g., clarity and simplicity).

All these pieces of information have served the team to work on a social innovation entitled “Neurorozwojownik” [in English: Neurodeveloper], which is an e-learning platform allowing to diagnose one’s own learning preferences as well as learn about effective and brain-friendly learning methods. It is an online course in which each interested and motivated participant goes through 8 modules divided into stages and paths. Stage 1 comprises 5 modules regarding: 1. the brain, the objective and plan – self-management over time, talent management, visualisation method; 2. visual thinking; 3. Mnemonic techniques; 4. Self-motivation – selected elements of coaching, self-coaching, career coaching, and mindfulness; 5. Neuromethods – brain-friendly learning/classes, which, e.g., allow the participant to learn about the neurobiological basis of learning and the fact that its application allows to fully use the potential of learners. Stage 2 is divided into the following modules: 1. personal life; 2. personal development; 3. professional development (the relevant materials have been prepared with the use of brain-friendly methods). Additionally, the participant has access to: tests (in the “Diagnostic Laboratory”) that verify the dominant channel of information acquisition and processing, which allows to get to know about one’s own learning preferences; as well as to a library (i.e., a collection of exercises that, e.g., reduce stress, which is a precondition for using brain-friendly methods, and increase motivation – elements of career and self-coaching) in a form of interactive exercises; printable materials; podcasts; and to consultations with a coach (for each participant) and a methodologist (i.e., a trainer, teacher). In stage 3 of implementation of the innovation, the operation of the whole course on the platform (i.e., prototype 3) was tested. Testing was performed by 30 people interested in testing (as enrolment was open), who were selected randomly. Some of those people met the bonus criteria (as in Chart 1). Due to the fact that there are two paths

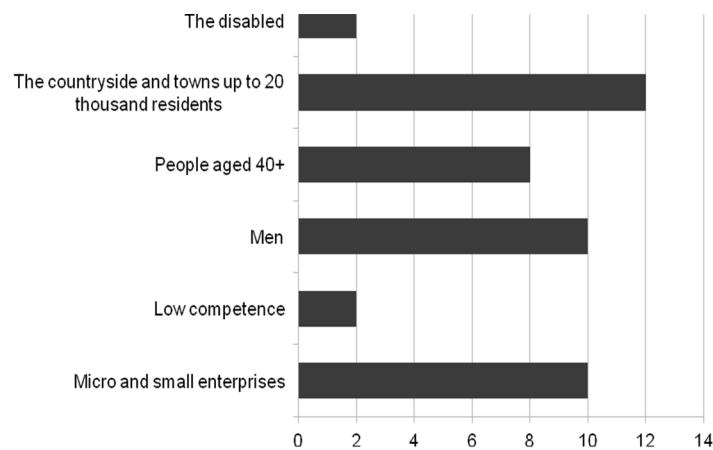


Chart 1. Participants meeting bonus criteria in the project

Source: own work.



available in the online course, the testers were divided into two groups. The first group was trainers who plan or have wanted to plan or already run their classes (regardless of the area of interest or subject) in line with the rules that neuromethods are based on and the second group was people undertaking education/self-education. In the course of selection, educational advancement and age were taken into consideration.

The objective was, first and foremost, to test the readability and level of understanding of the presented course by the testers. What is more, it was verified to what extent the trainers were able to adopt the knowledge acquired as a result of completion of the course in practice (as the final task for this group was to devise a class scenario with the use of brain-friendly teaching methods/techniques).

The authors of the Innovation believe that the testing ended in success, which means that the opinions of the testers who have completed all the tasks on the platform were positive. In the evaluation survey, the testers were asked to assess the course provided on the platform in terms of its usefulness (and 26 people rated it 5 whereas 4 people rated it 4), ease of use of the platform (and 27 people rated it 5 whereas 3 people rated it 4), and motivation to recommend it to others (and 28 people would recommend it to others (5) whereas 2 would probably recommend it to others (4))<sup>33</sup>. Additional feedback was provided in an open question, that is: “the platform is visually attractive; it is a very good development tool, I wish there had been a tool like this when I was young; very useful exercises; interesting materials; it was a pleasure to use the platform; it should be popularized.” Both the answers provided to the survey question as well as individual statements recorded in the

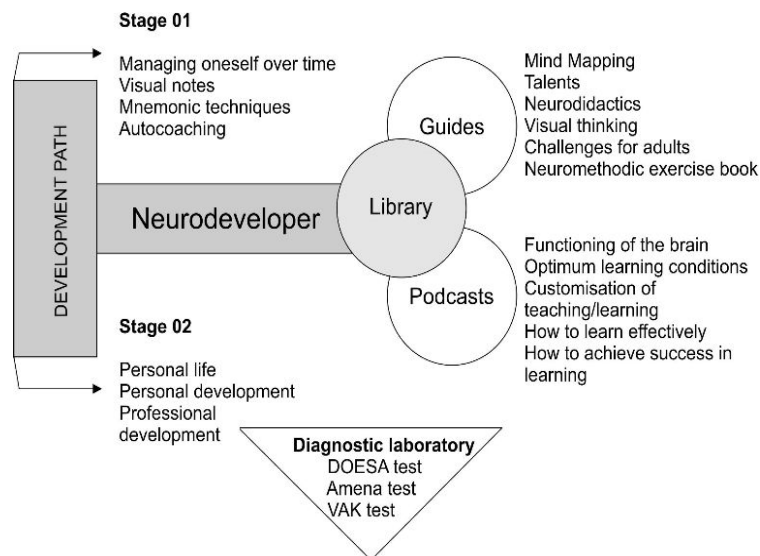


Figure 1. Model of Social Innovation

Source: own work.

<sup>33</sup> Scale from 1 to 5, where 5 means very good.

course of in-depth interviews with coaches<sup>34</sup> and assessment of the task by an expert allow to conclude that the Innovation was evaluated very positively since it meets the primary assumption – its elements were developed in compliance with the rules governing the functioning of the human brain.

There are currently not many propositions in the Polish economy for adults to use brain-friendly methods and techniques based on brain research and the described innovation seals this gap. It combines actual support in the form of a coach/mentor/expert with a remote tool. Owing to its versatility, the model that is being described is adjusted to the needs and possibilities of each person. Scalability of the model manifests itself in the structure of the idea – it can be adapted to various organizations and competence levels – the authors of the model share this knowledge with other educators.

The use of neuroscience is a developmental trend that is also present in shaping the policy of Life Long Learning that gives greater than ever advantage in building the knowledge economy with a diversified society. The presented model is unique in character and may be used to reflect the actual needs on the labour market or treated as a standalone course that can be adapted to each area of the economy (especially the one that requires greatest support – the SMEs).

## 6. CONCLUSION

The deliberations presented above confirm the hypotheses put forward in the article and allowed to achieve its objective. The key conclusions drawn from literature review and author's research are as follows:

1. A stronger than ever need to acquire knowledge on brain activity in various situations has emerged as people managing organisations should realize that an employee will reject a profitable offer, if he or she is experiencing an emotion.
2. Emotionality and intuition are effects of activity generated by perfectly specialized brain areas. Empathy and developing emotional intelligence are two of the most important competences of the managers and employees of the future. Even today it is already hard to exercise management, work in a team or carry out projects without them, yet no one teaches them professionally<sup>35</sup>.
3. Learning about human thinking processes determines the way one sees various phenomena.
4. Knowledge about the brain may be used in order to develop employee educational and training programmes (including for managers).
5. People are intrinsically motivated because there is an effective prize system in their brain and there is no motivation without learning.
6. The first and the fifth of factors may limit the speed of using the neuroscience in management (acceptance of knowledge and motivation to use it). Despite this, the

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<sup>34</sup> The testers pointed to the possibility of using particular techniques in conducting trainings in various areas as well as to the usefulness of knowledge on the brain in planning changes, motivating, conflict resolution, intergenerational communication, and building teams.

<sup>35</sup> R. Ohme, *Change in Management is Approaching*, 2015, <http://inemo.pl/wp-content/uploads/2016/03/THINKTANK-2015-Nadchodzi-zmiana-w-zarz%C4%85dzaniu.pdf> (accessed on 10 July 2018), p. 59.

second and the fourth of all are the basis for development this science in human resource management.

Neuromanagement is an example of an interdisciplinary field of study, which could emerge due to the development of technology enabling excellent progress in terms of brain activity imaging. Of course the research findings that are already known do not account for everything but the perspectives for development are promising. Although each research method has its limitations, these methods allow to get numerous answers to questions regarding brain correlates.

The development of neuroscience has cleared perception of the world of all outdated and inaccurate ideas of a rational homo economicus and provided a foundation for change of the paradigm towards an emotional-cognitive homo neuroeconomicus<sup>36</sup>. Taking the above into consideration, the future of human resources management in an organisation is going to be based on recognizing individuality of employees, including their personal and developmental needs, as well as on acceptance of their co-deciding about themselves and the reality they operate in.

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## NEURO(ZARZĄDZANIE) PRZEZ PRYZMAT BADAŃ NAD MÓZGIEM

Główną tezę artykułu jest twierdzenie, iż wykorzystanie neuronauk w zarządzaniu zasobami ludzkimi stanowi dobry kierunek do skutecznego wykorzystywania potencjału pracownika. Współcześnie neuronauki stały się naukami interdyscyplinarnymi, w których fachowcy z różnych dziedzin wspólnie pracują nad badaniem skomplikowanego organu, jakim jest mózg. Podejmują próbę wyjaśnienia procesów myślowych, odczuć, emocji, procesu decyzyjnego. Rozwój technologii pozwolił na powstanie kilku istotnych metod neuroobrazowania, dzięki którym uzyskujemy odpowiedzi na klasyczne pytania zarządzania zasobami ludzkimi, szczególnie dotyczące motywów człowieka w podejmowaniu decyzji i dokonywaniu wyborów, przede wszystkim w nabywaniu kompetencji (motywacji do uczenia się). Źródłem odpowiednich rodzajów informacji o motywacji są różne obszary mózgu, a za połączenie informacji i nakierowanie motywacji na właściwy (w ocenie mózgu) cel odpowiadają przede wszystkim przyśrodkowe obszary kory przedczołowej. Artykuł zawiera prezentację wybranych wyników badań metod neuroobrazowania mózgu i ich wpływu na zmiany w zarządzaniu

organizacją, szczególnie w aspekcie zasobów ludzkich oraz informacje o potencjale neuroprzebieżników stymulujących motywację. W drugiej części artykułu autorka prezentuje autorski model uczenia się osób dorosłych oparty na założeniach neuronauki, który powstał jako wynik dwuletniej pracy Metodą Design Thinking, od fazy pomysłu do innowacji (produktu gotowego), poprzez etapy preinkubacji do inkubacji, w ramach których testowano prototypy na grupie badawczej.

**Słowa kluczowe:** neuronauka, neuroprzebieżniki, zarządzanie zasobami ludzkimi, motywacja do działania.

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