University of Macedonia- Department of International and European Studies

Ma in International Public Administration- A Thesis in the Field of Human Resources Management

Aspects of the impact of Neuroscience on Human Resources Development

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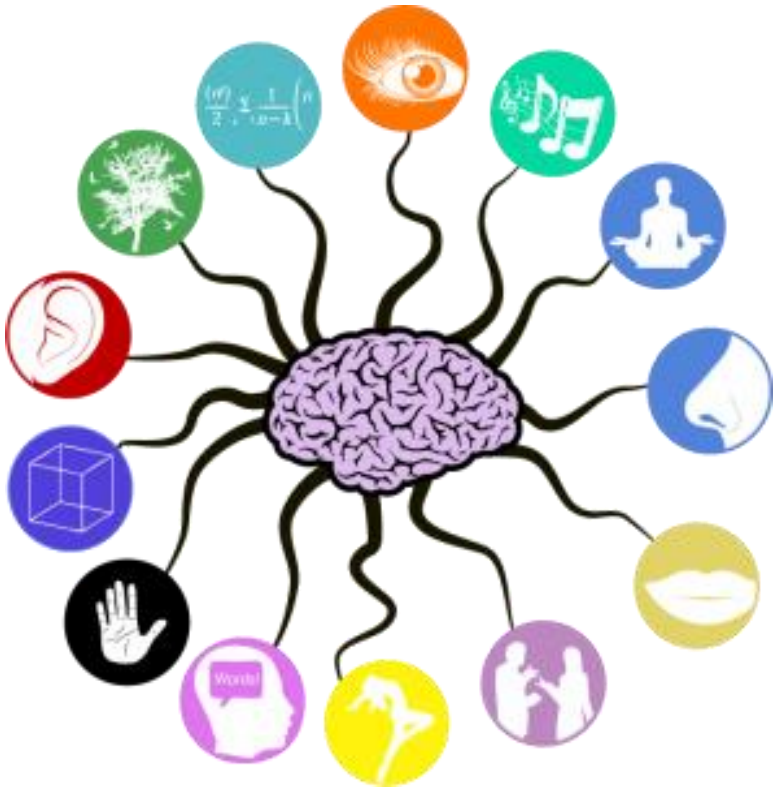
Abstract

Over the past years there is an increasing interest in the topic of cerebral function and how this affects human behavior. This field seems intriguing not only for Academics, but also for the rest of society, including governmental and corporate actors. Technological advancements seem to have opened the «Pandora's Box» while multiple sciences are emerging and evolving such as neuroscience; a discipline consisted by a plethora of fields. Its range of topics is endless and potentially overwhelming. Its specter expands from medicine and market to sociology, psychology and education. However, the present research will be focusing on social neuroscience, a branch devoted to the mediation of the brain with social interactions and behavior. It will be investigated whether it could have a significant impact on the field of human resources development (especially on performance, education, etc), while searching potential tools of implementation and assessment. Furthermore, the thesis will explore potential limits of its use. The preferred methodology will be done by reviewing Academic research papers along with books in order to gain a broad understanding of the topic. Even though the present research will attempt to investigate meticulously the subject, a more thorough investigation will be required in order to overcome the tip of the iceberg.

Frontispiece



Biographical sketch

Mrs. Foteini Petrou is a postgraduate student in International and Public Administration of University of Macedonia. Having graduated with a Bachelor of Sociology from Panteion University of Social and Political Sciences in Athens, she has pursued and acquired certification in Consulting and Professional Orientation from the University of Aegean, and in Pedagogic and Teaching Adequacy from National and Kapodistrian University. During the undergraduate program, she had worked briefly in the public sector at the public power corporation and later on at a private medical office as an administrative secretary, giving her an outlet to apply theoretical knowledge in a practical setting. This was also the beginning of an everlasting pursue for expansion of theoretical and technical skills.

Since her graduation, she has been working at a London based multinational company called Spandidos Publications as a senior production manager. As part of her role, she implemented all the necessary actions to manage, prepare and issue the monthly journal of Molecular and Clinical Oncology. It should be noted that the languages used verbally and in written communication were both English and Greek. Throughout her 4 years of experience, several qualifications were acquired such as excellent organizational skills, willingness to show initiative, thorough and methodical approach to her work and a great attention to detail. Furthermore she invested her free time into learning other languages such as Spanish and French, and expanded her digital skills on Indesign, Photoshop, SPSS, Limesurvey and other windows programs.

Her ultimate professional goal is to pursue an academic career after cultivating her knowledge in the field. Apart from learning through reading, she enjoys meeting different cultures and societies through travelling, further broadening her horizons.

Dedication

This dissertation is dedicated to all those who stood by me as my strong pillar, my source of inspiration and strength throughout this program. A special feeling of gratitude to my sisters Vasiliki and Maria whose words of encouragement and push for tenacity ring in my ears, always believing in me even when I fail to do so. They were truly a fountain of moral, spiritual and emotional support. To my brother in law Christos with his witty humour who always offers his wisdom and support in this journey of knowledge. To my mentors who shared their words of advice and encouragement to finish this study. To my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake and who supported me financially in this endeavor. To all those who shed light to my darkest times, thank you.

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Introduction

Neuroscience is a vast field of study which has been traditionally associated with biology and medicine. The study of the nervous system has opened the gates into exploring the depths of the unknown conscious trying to unlock the mysteries of the cerebral function, its structure and its mechanisms of potential influence. Over the years neuroscience has bloomed and became an interdisciplinary field of research, with scientists accumulating in their attempt to shed light in the cerebral functional aspects and to discover new tools for development in the micro-level.

The understanding of the way of noetic reaction in particular circumstances and conditions has sparkled the interest of Academics who focus in various fields such as cerebral development, learning, memory, emotions and decision-making. Social cognitive neuroscience offers profound insights into multiple distinct decision-making systems, each competing for control over choice behavior. Some researchers claim that the capacity of making ethical judgment has neural basis (Greene et al., 2001). In social interactions, people are occupied in emotionally-driven behaviors. Studies have shown that emotion can influence multiple cognitions, such as attention (Brosch and Van Bavel, 2012, p. 314), memory (Rimmele et al., 2011) and perception, not only to the person undergoing the sentiment, but to the whole interacting group alternating their mental paths. Decisions are taken based on the interpretation of the world through our senses. During the decision-making process memories are evoked, concerning the mental experience of our emotions (Brosch et al., 2013, p. 5). Planning is the ability to make choices between alternatives and past feelings (Plessis, 2011, p. 123). The choice will be grounded to the feedback system from the frontal lobes to the limbic system, as well as the dopamine levels which are linked to desirability, motivation and reward-seeking behavior. Evidence from Neuroscience may suggest that there is no free will and each action a person makes is simply the product of previous actions and biological impulses that escape human control (Henry and Plemmons, 2012, p. 576).

In the endeavor of choice creation other key elements affect the individual. The experiences and perception of the world are molded, among others, by culture, personality, mood and memory. These elements are interconnected with neurons which are responsible for memory, state of body, state of mind, environmental reaction and evaluation of the world (Plessis, 2011, p. 123).

An implementation of the strategies and mechanisms from neuroscience can virtually affect any aspect of cognition. The available neural lenses of knowledge promise to find solutions to organizational problems and to explore the mysteries which lay ahead. Therefore a linkage of social cognitive neuroscience to human resources (HR) development is attempted and researched extensively. The main aim is to comprehend

the relation between the corporate behavior and the neural connections so that particular anticipated social processes can be implemented in wider settings. The implementation of Neuroscience in the industrial world can be attributed to the fact that once harvested it may aid in the construction of an evidence-based HR system which would be enrooted in the cerebral functions, working with them aiming in acquiring credibility with stakeholders and driving organizational results. It may offer unique benefits to withhold or even excel exponentially grow in the business community. Neuroscientific use may act as a catalyzer since it may provide invaluable insights into a plethora of HR practices such as leadership, employee engagement, training and development, stress reduction, talent acquisition, job satisfaction and performance management.

Its proper use can offer profound benefits in the workplace. It can provide mechanisms for the preservation of attention and can be utilized for the creation of a distraction-free working environment. The provided insights can battle management myths such as the one of multitasking, which is a recent trend of task force. A research showed that no person can consciously sustain more than two things in their brain and that multitasking increases error rates by 50 percent (Arantes, 2017).

By reaching higher levels of cerebral knowledge, its cognitive capacities and its limitations, and by applying that awareness in the social environment, scholars could contribute in the creation of a more enhanced version of humanity. That knowledge could enable the aversion from negative influences that impact productivity, performance and overall wellbeing. A convergence of recent findings has inspired the creation of new perspectives and idea generation in the industrial arena. When the setting is carefully planned and designed it may be transformed in an effective organizational tool which could aid the greater management of employees' emotional responses and a attention.

This study will examine the effects of neuroscience on HR development by assessing its relation with the working policies. Furthermore, a presentation of the weaknesses of its application will be attempted. The methodology used, towards the exploration of the answer in the research aim, was done by reviewing academic research papers and international related literature in order to gain a broader understanding of the topic through a qualitative review. An attempt to combine the outcomes of several studies, which investigate the same phenomena, will be presented. Concerning the theoretical models of cerebral strategies, the preferred methodology will be mostly in a micro level.

The present research is divided into seven chapters. In the first part, context on the anatomical and theoretical background will be given via the assistance of the available world literature on social cognitive neuroscience. Firstly, the cerebral

structure will be presented concisely. After this short depiction, it will be argued that encephalic alterations can and will occur during or in the absence of social interaction. Some factors of change will be also included. It will be apparent that each case and each emotion can promote or even block the creation of neurons in the experiencing person or in others that surround him[1]. For the better demonstration of the socio-environmental impact certain examples will be presented. Even though neuroscience seems to be relatively a new scientific field it will be shown that philosophers and practitioners were searching to shed light into the cranium from the ancient times. The scientific background of neuroscience in the organizational arena will also be briefly presented. Corporations evolve and adapt to technological changes. Little-by-little the trend seems to incorporate the knowledge from neuroscientific domain in the industrial setting. In this evolution HR development tries to fit in and adjust. Despite the fact that relatively a limited amount of available neuro-HR interdisciplinary studies exist, this field of interest is full of possibilities and challenges. The understanding of human perception and encephalic reaction could be the key to unlock countless opportunities for personal development. In chapter five (5) it will be attempted to link the theoretical framework with the practical setting, while the following chapter will investigate the extent to which the new trends have been incorporated in the public sector. In the last chapter, some of the potential limitations of its use will be explored before reaching the concluding ideas of the study.

[1] Throughout the assignment the male pronounce will indicate all genders.

1.Cerebral structure

This part deals with the exploration of the cerebral labyrinth by presenting briefly the encephalic structure, while including the theoretical background of neuroscience. After a historic introduction of this scientific field, the focus will be placed in the contribution of neuroscience in the HR development.

1.1. Brain structure

The human brain can be roughly separated into three areas: the lizard brain, the mammal brain, and the neocortex (McGurran, 2017). The lizard brain is responsible for the surviving mechanisms of the body. Its main functions include respiration, digestion and heart beating. This cerebral area is surrounded by the mammal brain, also known as limbic system. Its main responsibilities revolve around safety. Within the limbic system memories of experiences are restored. Since it desires safety it loathes change and pushes the person in repetitive actions. The final encephalic region is neocortex. It is the most consciously accessed area. It houses rational thought, learning, decision making, empathy and creativity (ibid). These areas are not necessarily in accordance every time. When a new experience is pursued by the neocortex, the mammal brain tries to obstruct it by creating anxiety or fear. All these sectors are covered with neural networks which expand or scale down depending on their use.

1.1.2. Neurons and synapses

The encephalon consists of its neurons, synapses and glia. The cells appear to be the same with the densities of synapses and neurons varying. Neurons are specialized body cells of the brain, which are interconnected. The special functions of the cells and how they interact specify the functions of the brain (Zhang, 2008, p. 5). Neurons are cells with known and definable boundaries, since they are bounded by membranes. Some of them eject axons[2] that could expand to remote parts of the soma and be responsible of transmitting electrical signals, affecting thus the reactions of other glands, neurons or muscles at their termination points. Simultaneous induction of responses among many neurons can be done when a single axon synapses with them (Lodish et al., 2000). Neurons communicate with each other solely at specialized points of appositions. Those connecting points of the neural map are called synapses, from the Greek word synapsis which means conjuction. It is estimated that the human brain comprises approximately 100 billion neurons, interacting through trillions of synaptic connections, function both as single units and as larger ensembles (Braslow et al., 2019, p. 1).

[2]Extended slim filament of axoplasm.

As an organ, the brain is part of the central nervous system along with the spinal cord. It resides within the cranium and has three parts: the cerebrum, the cerebellum, and the brain stem. The cerebrum is located at the highest part of the brain. It comprises the largest part of the encephalon, as it accounts for two-thirds of the total weight of the brain (Augustyn, et al., 2005). It splits into two hemispheres with the one controlling language and speech, and the other interpreting optic and spatial data. With its lobes (frontal, temporal, occipital and limbic) it is responsible for the control of movement, speech, corporal senses, memory, auditory and visual reception, scent, taste, and emotions.

The cerebellum is positioned at the back of the brain. Even though it accounts for approximately 10% of the brain's volume, it contains over 50% of the total number of neurons in the brain (Knierim, 2019). It receives information from the sensory systems, the spinal cord, and other parts of the brain and then modifies the commands, making the movements more coordinated and accurate. Other tasks involve maintaining balance, posture and some cognitive functions.

Finally, the brain stem or Truncus encephali is the posterior part of the brain adjoining and structurally continuous with the spinal cord (Courses .lumenlearning.com, 2019). Even though it is small, it represents a vital part of the brain as it is responsible for basic functions, such as breathing, cardiac regulation, consciousness, body temperature control, and the sleep cycle. If an injury occurs to the brain stem, usually it means irreversible coma and death. Attach to the brain stem, encased in the bony vertebral column (Zhang, 2008, p. 4), resides the spinal cord. It transmits information from the rest of the body to the brain and vice versa[3].

Neurons and synapses are a vital component of the central nervous system, as they are the gateway to the human perception of the external world. Through the five senses and the given interpretations via the process of unconscious and conscious thinking, the psychological and physical reactions are activated. Depending on each person's experience, it is evident that the synapses differentiate. Thus, continuous reciprocal interconnections between genes and external stimuli alter the structure and function of the encephalon throughout the lifespan of the individual. Influences from the societal framework may include cultural background, education, past experiences, and interpersonal interactions. With every interaction a change occurs in the cerebral map and new patterns are created for future use.

The next part will present the factors which contribute to the alterations in the encephalon and how external forces can dictate or influence a person's thinking and reaction.

[3] Apart from the central nervous system, the human body possesses the peripheral nervous system which is not included in the present assignment.

2. The impact of environmental factors on the decision-making process

As Heraclitus had supported many centuries ago, all things succumb to change. Reality itself is in a continuous motion within the framework of the cosmos. His lead belief was that everything is continuously in flux; the sole thing that does not alter is change itself (Graham, 2020) Some change from one state to another is implicit (Ashby, 1957, p. 9). Although Heraclitus did not speak about neuroscience at his time, his theories could be applied within a certain extend in this case, since the brain does not constitute an exception. With every interaction the composition of the brain alters. Given that humans are by nature social "animals", cerebral change is inevitable, so as to adjust their behavior to the various societal contexts. Society helps in formulating the person's self-determination via the construction of its identity by social recognition. Social engagement is so important for people that most psychiatric disorders involve some disruption of normal social behavior, and that in several disorders abnormal social functioning is one of the central symptoms (Young, 2008, p. 391).Taking into consideration that humans are not created in a vacuum, environmental exposures form their experiences and determine the way they perceive their reality.

2.1. Perception

According to Bourdieu perception is the product of a socially constructed environment and actors tend to perceive the environment as natural and objective (Sieweke, 2014, p. 29). Since their actions are a product of the habitus they have a tendency in reproducing the regularities of the surrounding environment through their actions, "while adjusting to the demands inscribed as objective potentialities in the situation" (Bourdieu, 1977, p. 78).

The evaluation of the cosmos usually relies in human perception, which was the object of research thousands years ago. The most renowned paradigm for the subjectivity of the senses and the realization of the world was given in Plato's book "Republic" (Plato, 514a-515a; Levinsohn and Ross, 2018, p. e43). In a form of a dialogue between Socrates and Glaucon, Plato stresses the fact that the effect of true education should be used when experiencing a situation via our nature. According to Plato, human perception is nothing else than a mere opinion deriving from sensual experience. In the cave allegory, Plato underlines the importance of philosophical reasoning for the acquisition of true knowledge. People who believe only based on empirical evidence are prisoners of the world only knowing the shadow of the true. The philosopher who escapes from the chains and reaches the ultimate philosophical knowledge should return and help others to liberate themselves from their prison of misconception. Neuroscience confirms this notion and expands this concept by

creating a mechanism that could potentially alter or at least influence the person's perception of the world.

2.2. Cultural background

The perception of the surrounding environment is deeply enrooted in culture. As a way of illustration, the example of canine consumption could be given. Many civilizations would consider unthinkable or even inhumane to eat a dog, while others, such as the Vietnamese believe that eating dog meat would bring good fortune (Arthurs, 2001). On the other hand, western cultures would enjoy eating a burger, while Hindus would be horrified to the aspect since they consider cows as sacred animals, which symbolize life itself. Undoubtedly, culture plays a key role into the formation of beliefs, while determining the individual's reactions. Culture interacts with environmental and biological factors to shape the mind, brain and behavior across stages of development (Chiao, 2018, p. 77).

The description of cultures allows researchers to form hypotheses. According to Hofstede, culture is defined as "the collective programming of mind distinguishing the members of one group or category of people from others" (Hofstede, 2001, p. 9). After investigation with his research team he produced five dimensions of national culture, which are power distance, uncertainty avoidance, individualism/collectivism, masculinity/femininity and time orientation. There are cultures which accept hierarchy and inequality, which are more nervous toward change, while pursuing individualistic long term gains. And there are others who seek the exact opposite. The knowledge of their origin could give the observer valuable information regarding the future decisions of the subject.

2.3. Personality traits

Cultures shape the person's identity and contribute in one extend to the formation of its personality, by influencing the creation of some of its aspects. These influences could both be conscious and unconscious. Regardless, depending on their personality, people are more prone to certain decisions. Personalities are characterized in terms of traits, which are relatively enduring characteristics that influence the individual's behavior across many situations (Open.lib.umn.edu, 2015). This explains the existence of multiple personality tests which aid consultants and educators in their fields of work. Personalities may provide the element of predictability in the decision-making process since depending on them certain types of experiences are preferred. One scheme which has been used extensively is the one known as the "Big Five" personality factors. The factors of this model - extraversion, agreeableness, conscientiousness, neuroticism, and openness - (Arvey et al.et al., 2016, p. 171) are utilized to justify organizational end results. Personality can be considered as one of the elements, which play a great role in behavioral manifestation. Business

opportunities are more likely to be identified by people with creative personality (ibid, p. 172). Personality traits are the result of heritability, social environment, self-evaluation, self-esteem and self-efficacy (ibid, p. 172).

2.4. Past experiences and emotions

The formation of one's identity relies also in the experiences of the past. Experience-based tasks result in higher correlation between studied brain variables and behavior (Yechiam and Aharon, 2011, p. 1). Previous encounters aid when the person faces uncertainty and confusing information while having to produce complex decisions. Experiences can alter the circuitry in the person's brain and create mental paths for future use. This rewiring can create patterns of behavior to be used appropriately when responding to external stimuli. All experiences are linked to a certain emotional creation and depending on the anticipation of the person's past emotional experiences choices are created.

Emotion has been highly associated with moral judgments (Rozinet al., 1999, p. 574) and has been proven and established as a substantial factor of influence, since emotional events are remembered more clearly, accurately and for longer periods of time than are neutral events (Tyng et al., 2017, p. 17). Evidently, emotions are a key element of decision-making which play a central role to the process of choice acting both as an input and an output (Han, 2009, p. 2-3). Apart from a reaction based on the anticipation of a feeling, any decision generates a consequence which results to the creation of emotions fueling future decision procedures. Positive and negative emotion states may be adaptive as they prepare individuals for important information processing and actions (Beer and Bhanji, 2011, p. 160) as they help them perceive and remember the external stimuli. Furthermore, the orbitofrontal cortex[4] is involved in mediating emotional influences on decision making by evaluating the relevance of those information (Beer and Bhanji, 2009). Negative emotions, such as anger and fear, also influence this process, since they can promote or reduce the risk-taking, respectively. The impact of emotional responses has been extensively investigated in the domain of neuroscience and correlations are drawn among emotions, contemplation and behavioral responses.

2.4.1. The impact of emotions on the corps and behavior

There seems to be an everlasting correlation among thoughts, emotions, behavior and somatic reactions. Every decision is based on the assumption that the person's beliefs are realistic and true. In practice, everyone's beliefs are an idea which needs to be verified for its validity prior to its acceptance as truth. In reality, each system of

[4]The ventral surface of the frontal lobe, and is critical for functions ranging from olfaction and emotion to learning and behavioral flexibility.

values is usually based, among others, in childhood memories, where the ideas are imprinted and acknowledged as universal. Some beliefs may create biases or fears towards others and dictate the person's reactions. However, once identified they may be changed through series of specific strategies provided by a specialist. Examples of childhood memories and social interaction are presented in the table below (Table I).

Table I. Exemplī grātia of childhood remembrance and societal interaction.

Past experiences	**Existing fear**	**Subconscious belief**
At the age of 4 the person's presence was avoided by the older brother as he considered his sibling annoying	Addressing supervisors	Authority figures should not be disturbed
While in first grade, the teacher mocked the person in front of the class	If he poses a query, he will be humiliated	Authority figures will humiliate the other person if given a chance
At 7 years of age a verbal fight between the person's parents resulted in marital abandonment	By demanding or claiming anything, the other will be infuriated and will decide to distant himself	If he provokes anger, then he will be abandoned

Another factor which affects social interactions is anxiety. Anxiety is defined as the response to prolonged, unpredictable threat, a response which encompasses physiological, affective, and cognitive changes (Robinson, 2013, p. 1). While experiencing it, the physiology of the brain may change, since the produced hormone -known as cortisol- can reduce, delay or obstruct the creation of neurons in the hippocampus. High levels of cortisol can lead to irritability and fatigue whereas the person presents memory gaps and deregulated attention mechanisms. These are some of the symptoms indicating that the synapses are modified and the brain starts to shrink. At that time there seems to be an impact in the ability of decision making and control of impulsive behavior. The stress hormones can aggravate the size and activity of a certain brain region, known as amygdala, causing negative emotions to be restored as memories. These factors create an ambiance were future stressful situations are dealt with greater difficulty. Stress disorders promote mechanisms associated with harm avoidance across multiple levels of cognition (from perception to attention, to learning and executive function) (Robinson, 2013, p. 1). If chronic, it leads to problems in both social and working environment, by leading to physiological and psychological depletion, vulnerability to illness, and behavioral

problems such as inattentiveness, aggression, and poor social interactions (Bartlett et al., 2017, p. 639).

Anxiety can provoke permanent alterations in neurons and synapses. The behavioral and hormonal consequences of stress can also be transmitted to others (Sterley, 2018, p. 393), but whether this has enduring consequences for the neural networks and synapses is still unknown. A study conducted in the Cumming School of Medicine's Hotchkiss Brain Institute, at the University of Calgary examined the impact of anxiety in pairs of male and female mice. During the experimental process, the research team isolated one mouse from the team of two and subjected it to mild stress conditions. After that, it was returned to its pair. Upon close examination, it was discovered that the neural circuits of both mice were affected in the same way. It was revealed that the stressed mouse was signaling chemically its partner. When the pair received the alarming indication it turned to notify the rest of the group. Even though these data refer to animals, their inclusion allows for critical insights into the molecular and cellular mechanisms of the influences which noninvasive human research cannot provide (Tost et al., 2015, p. 4121). The interaction within groups can also be present in humans were anxiety is communicated even subconsciously and stress symptomatology is present in close societal groups. However, the capacity to perceive and understand the other's emotional condition contributes to the creation and construction of social bonds that facilitate the working procedures.

2.5 Expectations and beliefs: The Self-fulfilling prophecy

Emotions and mood are closely related, however, emotional reactions are short-lived compared to mood states (Vinckier et al., 2018, p. 2). In certain situations, mood can affect an individual's thoughts, attributions, and expectations, which, in turn, influence their decisions (Mayer et al., 1992). The state of mood can create bias in the process of decision. When someone feels happy, he tends to consider the others favorably as opposed to those of negative mood state. More specifically, it has been observed that depressed patients tend to neglect positive aspects, whereas manic patients tend to ignore the potential negative consequences of their actions (Beck, 2008, p. 975; Vinckier, et al., 2018, p. 2). Depending on the person's state of mood certain expectations are created during its social interactions. Those expectations can affect the decision-making process.

Every person's experience is restored in his mind. The way in which those memories are perceived creates patterns of neural connections (neural pathways), and their additional use leads to their transformation into communication paths. These neurons that are responsible for the memory traces and the revival of a memory are also involved, in different combinations, in thousands of other mnemonic acts (Ashby,

1957, p. 62). These are the repeated familiar ways in which any external information is filtered before been restored once more into the brain. Those are the person's beliefs which do not necessarily correspond to reality.

Beliefs are more permanent than emotions and have a great impact to the person's life. The beliefs are usually correlated to the individual's self-esteem and may act as a prediction of an upcoming outcome. That expectation directly or indirectly comes to realization simply because the person believes in it. This socio-psychological phenomenon was first described by Robert Merton using the coined term self-fulfilling prophecy. According to him self-fulfilling prophecy is "a false definition of the situation evoking a new behavior which originally false conception come true" (Biggs, 2009 p. 294). A person could find oneself entrapped in a circle of beliefs and actions which produce the expected results reinforcing thus the perception of their validity. If the person does not believe that he will achieve a task, then the likelihood of not achieving it is high. The individual's cerebral maps become their reality, and any interpretation of any behavior deepens those personal maps.

One example of this theory may include the power of the placebo effect. A placebo is a non-medicinal substance designed to seem like a real treatment, but without directly affecting the disease. The individual who receives the "treatment" will experience the expected results. Placebos won't lower the cholesterol or shrink a tumor, but they can work on symptoms modulated by the brain, like the perception of pain (Harvard Health Publishing, 2017). This happens in up to 1 of 3 people (The American Cancer Society, 2015). The effects of the placebo on the brain were identified by Tétreault et al. in 2016. By the use of MRI the research team observed the cerebral reaction of placebos in patients with chronic pain from knee osteoarthritis. The findings revealed that the brain activity focused in the midfrontal gyrus, a brain region predicting drug response (ibid, p. 5).

Self-fulfilling prophecy can also be manifested in working environments. Either at a job interview or at a task assignment, lack of self-confidence could lead to failure. If the employee feels underqualified it could result to lowering his efforts and avoiding asking help from others. When the feat fails it verifies the initial belief and the neural patterns deepen. Interpersonal interactions can also influence the outcome. Even when the employees are confident about their capabilities if the manager is not certain, he may invest less effort on the project neglecting to provide extra skill development. Without the proper resources the employees fail to complete the project due to the manager who doomed it (Ackerman, 2019). The person's expectations could also be attributed to cognitive biases.

2.6. Cognitive biases

The existence of cognitive biases may influence the individual's beliefs and may result in the distortion of the thinking process. Cognitive bias is considered a form of an error when the brain attempts to simplify information processing received from the surrounding environment. In order to simplify judgmental operations, people rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values (Tversky and Kahneman, 1974, p. 1124). Even though these heuristics are helpful, in certain occasions they could steer to grave and systematic errors. Biases can operate effortlessly and sometimes while been unaware of their impact. In certain cases they affect the personal, professional and general point of view of the person when it comes for instance to recruit new employees or to assess performances. Luckily a few minutes of self-reflection may obstruct their infiltration into the working arena.

2.7. Other agents of socialization that can contribute in the creation of neural pathways

A wide range of influences from the external environment could potentially create enduring effects on brain circuits and behavioral reaction. In the socio-environmental context a crucial element is played by the parental and educational arena. Negative experiences could affect the prefrontal cortex[5] and augment the risk for the appearance of learning disabilities, behavioral and emotional abnormalities and a broad range of disorders (Tost et al., 2015, p. 4122). On the other hand, positive engagement may improve neural plasticity and aid in the growth of mesolimbic dopaminergic pathways[6]. Stepping away from the word and turn to isolation would not be a valid solution as evidence suggests that social isolation -or the perception of it- has direct deleterious biological effects (Cacioppo et al., 2012, p. 123), such as decrease lifespan, higher risk of obesity, delay of adult neurogenesis and increase of tumor growth (ibid, p. 124).

The present section contributed to the analysis of cerebral alterations that are caused by external influences. Within the context of society cultural differences, educational and parental background, previous experiences, interpersonal exchanges, memories, cognitive biases, stressful occurrences and past emotions all affect the functions of the brain. Depending on the case, each situation changes, affects, promotes or even obstructs the creation of neurons and the physiological growth of the mind.

[5]Is in charge of planning complex cognitive behavior, personality expression, decision making, and moderating social behavior. (The Science of Psychotherapy, 2019).

[6]Dopaminergic pathway (Dreyer, 2010) in the brain which facilitates reinforcement and reward-related motor function learning (Berridge and Kringelbach, 2015).

Additionally, some examples were given in order to better demonstrate the impact of the external stimuli.

The next part will revolve around the birth of neuroscience and its evolution throughout time.

3. Historical background of Neuroscientific field and its contribution to HR development

3.1 Exploring the paths of neuro-history : From ancient Greece to Roman times

Neuroscience seems an intriguing field which has gained considerable popularity. It has an interdisciplinary curriculum which includes a broad specrum for every aspect of human life from kinesthetics to thinking and behaving. As a science it aims to uncover the mysteries of the human mind in order to reveal the answers to the questions of how the encephalon really functions and why people are so distinct among themselves, since the cerebral structure is the same. For millenia philosophers pondered and psychologists researched so that the functions of the brain would be fully understood. For the past years neuroscientists with their tools and experiments on animals and humans attempt to find an answer to the same issue.

In the following section the historical background of neuroscience will be presented. Our mental time travel will guide the reader from ancient Egypt, to Greece, to the Roman eras, followed by the medieval times and the enlightenment period before entering the modern times.

The first known documented cerebral functional and anatomical description was made by the Egyptians about 3700 years ago (Coolidge and Wynn, 2018, p. 12). After 1.200 years the second one emerges. Since the fourth century BC the father of medicine, Hippocrates believed that the brain was responsible for the sensations and for the human intelligence. He believed that the source of well-being or misery relies in the power of the mind. In the chapter "On the Sacred Disease" of the Hippocratic Corpus he disregards the dogma that sickness was caused by the hand of the gods or evil spirits and provided a relatively modern explanation of the capacities of the human brain (Haykin, 2012, p. 8). More specifically he believed that:

"Men ought to know that from nothing else but the brain come joys, delights, laughter and and jests, as well as our sorrows, pains, griefs and tears. Through it, in particular, we think, see, hear, and distinguish the ugly from the beautiful, the bad from the good, the pleasant from the unpleasant....And by it, when it is unhealthy, we become mad and delirious, while fears and terrors creep in.... In these ways I am of the opinion that the brain exercises the greatest power in the man."

Hippocrates, On the Sacred Disease, Fifth Century, BC.

Hippocrates was considered as the founder of medicine and was regarded as a prominent physician of his time with high respect. The Oath which he created is still taken by physicians today at the beginning of their medical practice. His detailed

observations of illness and its symptomatology provided a greater understanding of the ways that health is affected by diet, injuries or malfunctions of bodily processes, and the environment. Until the decline of Rome in the fifth century A.D., Hippocratic practice remained visible within Roman sport and military (Haykin, 2012, p. 8). Faithful to the Hippocratic paradigm a Roman physician-philosopher would soon become an exceptional figure. During the Roman times Galen of Pergamon conducted reproducible experiments on creatures trying to comprehend the brain function and structure. Through his observations, he deduced that the cerebrum must be the recipient of sensations, and the cerebellum must command the muscles (Zhang, 2008, p. 4). Memories, sensation, bodily functions and human temperament should reside in the brain. His theories became dominant and he himself was considered an authority in matters of anatomy, physiology, and pathology for the next 1200 years.

Galen's writings dominated medicine from late antiquity to the Middle Ages. He occupied considerable space in the great medical encyclopedias and constituted the principal element of the curriculum in medical schools (King, 2019). The study of the brain in the following years was based in the anatomy and dissection. In the sixteenth century the first textbook of neuroscience was released. Published by Andreas Vesalius in 1543, the book De humani corporis fabrica (On the Workings of the Human Body) was characterised as groundbreaking in its anatomical content, innovative illustrations and modes of presentation (Beard, 2008, p. 221). Even though, the majority of the content was close to Galen's theory, Vesalius's underlined the fallacies and shortcomings of the Greek physician, which resulted by his research on animals.

3.2. Neuroscience from the 17th to the 19th century

In 17th century the idea of the soul is introduced by René Descartes. He distinguishes the mind from the brain, with the first having the role of thinking and the later the role of controling the body. The human intellection can perceive reality therefore the person must remove the mind from the senses (Hatfield, 2018) and reside to thinking. His argument can be summarized in one of his best known phrases: "cogito, ergo sum," or "I think, therefore I am". The next century brings the first proposal on using electricity to operate on the nerves. After his experiments with frogs' legs, Luigi Galvani indicated in 1791 a connection between muscular contraction and electricity. He believed a new type of electricity was created in the muscle and nerve (encyclopedia.com, 2005).

The 19th century brings the description of a large neuron by Purkinje (encyclopedia.com, 2015), and highlights the importance of the brain for speech. Pierre Paul Broca identified a common region in the brains of two of his speech-impaired patients (Stinnett and Zabel, 2018) and concluded that different regions of

the brain had specific functions.The specific discovered area, which is in charge of the expressive aspects and comprehension of verbal and written language, was named Broca's area. If injury or insults occur in this area it can result to Broca's aphasia, a condition where the individual is no longer able to produce correct or coherent speech, and lose the ability of repetition (ibid). This century also brings the measurements of the reaction time at which nerve cells produced electrical impulses and the Golgi's method of silver staining technique to observe the structure of neurons. The first picture made with the technique was published in 1873 (Finger, 1994, p. 45). In 1878 the first successful intracranial surgery is performed by William McEwen (Macmillan, 2010, p. 858).

3.3. Recognition of the cerebral science in the 20th century

The 20th century brings the recognition of neuroscience as a distinct Academic field, while the comprehension of the neural function and nervous system role became progressively precise. The first part of the century brings, among others, the categorization of neurons in the brain (Grant, 2007); the publication of an important paper on sensory disturbances from cerebral lesions (Pearce, 2000); the invention of electroencephalography (a method for recording "brain waves") by Hans Berger (Millet, 2002); the description of brain diseases such as Alzheimer and Schizophrenia (Kettenmann and Wade, 2014, p. 9); the development of muscle contraction principle and the explanation the minutiae of motor and sensory nerve transmission[7] (Pearce, 2018); and the discovery of the atomic and molecular beam magnetic resonance method of observing atomic spectra[8] (Shampo et al., 2012, e11) by Isidor Rabi.

During the second half of the 20th century the scientific research of the central nervous system was intensified, mainly because of the technological advances of that period. Those were the tools which allowed neuroscientists to investigate in depth the structure, development, abnormality, function (or malfunction) and alteration of the nervous system . The individual was treated as the fundamental unit of analysis, and the brain was treated as a solitary information-processing organ (Cacioppo et al., 2010). The rapid pace of developments enabled the better understanding of the complex processes within the neurons.

In 1950 Karl Spencer Lashley made the deduction that memories are not localized, but rather distributed, in the cortex (Josselyn, 2010, p. 221). Through research and practice many advances occurred in the treatment of multiple conditions such as multiple sclerosis, stroke and cardiovascular disease. In 1969 the society of Neuroscience was founded in America by bringing together scientists trained in a

[7]Lord Edgar Douglas Adrian showed that the effect in a neuron depends on the pattern in time of the impulses travelling in it, thereby providing a quantitative basis of nervous behavior (Pearce, 2018).
[8]a method used in MRI

variety of established disciplines under the common banner of neuroscience (Braslow et al., 2019, p. 1). This field became the leading scientific discipline with regard to funding, numbers of scientists, and numbers of trainees (ibid). The causes of many sufferings were no longer attributed to the repressed unconscious, but to the dysfunctions of the brain. In 1973 the brain's opiate receptor[9] was discovered and established (Thebrain.mcgill.ca, 2003) by Candace Pert and Solomon H. Snyder (Pert and Snyder, 1973). The following year the first images were produced and the first live human subject was imaged in 1977 (Chodos, 2006).In 1987 the first major breakthrough for the treatment of depression, offering superior efficacy and reduced side effects was introduced (Wenthur et al., 2014, p. 14).

The year 1990 was declared as the beginning of a decade contibuted to the brain. This signaled the scientific world to pursue more complex problems. The nervous system would no longer be treated as a solitary enity, unable to be influenced by the external world. This was the emergence of social neuroscience as a way to study the impact of societal factors and their interface on biological functioning. More specifically, social neuroscience was created to study the nervous system and its manifestation at many interacting levels-from molecules to societies- and to bring emergent structures that characterize social species (Cacioppo et al., 2012, p. 123). The collaboration between cognitive scientists and neuroscientists has helped solve puzzles of the mind including aspects of perception, imagery, attention, and memory (Cacioppo, 2002, p. 3). This field is blooming due to the available novel methods[10] and the previous accumulated knowledge. Contemporary scientists stand on the shoulders of those who went before them (Cacioppo et al., 2012, p. 125). New scienific questions arose and more interdisciplinary teams were required to unearth the structural linkage and dynamical correlation between society and mind. The compound cosmos, which is filled with an abundance of “abstractions representing the actions and influences of and the relationships among individuals, groups, societies, and cultures” (Cacioppo, 2002, p. 312) is now under the microscope. The research is no longer limitted in one faculty or one discipline, since multifactorial scientists accumulate under the umbrella of neuroscience all serving the ladder of knowledge.

3.4. Neuroscience in the 21st century

By the beginning of the 21st century the barriers between social sciences and neuroscience were falling, and the fields of cognitive and social neuroscience were aknowledged (ibid, p. 130). Neuroscientists were aknowledged as the new specialists of human conduct management. The available powerful techniques for observing the

[9]Basic technique for studying brain receptors still used today (Thebrain.mcgill.ca, 2003).
[10]Another useful tool added in the toolkit of neuroscientists was the functional MRI which was first used in human brain in 1992 to map encephalic activity.

activity of living brains is now being used in the service of cognitive research. The depiction of the brain is becoming more and more geometrically accurate, while the scientists try to overcome the challenge of implementing the information from single cell level to large scale populations. The possibilities of the new era have opened the gateways for : 1) gene editing; 2) nervous system monitoring and modulating through light technique; 3) controling protein function; 4) removing synaptic memories (Thebrain.mcgill.ca, 2019); 5) reducing fear memories without ever consciously evoking it (Koizumi et al., 2016, p. 2); and 6) researching for the creation of brain-controlled prosthetic limbs (Wood, 2018).

The new cutting edge techniques have caught the attention of the industrial world which little by little allows their implementation to the workplace environment. The information deriving from neuroscience could create a better working environment with more efficient and effective employees. The theories of neuroscience provide valuable insights as they offer important informations on what sort of strategies could inhibit and allow constructive collaboration and idea generation. It can also aid in the development of updated approaches in training and learning, which enables better educational retention. The best cerebral insight could lead to the creation of great interventions that could reduce stress, augment productivity levels, and enhance employee engagement.

This third section dealt with a relatively brief exploration of the historical pathways of neuroscience. The importance of the existence of a historical perspective relies in the fact that the education on how scientists are able to push past the limits of current concepts could enable the creation of “a new and more comprehensive understanding of the laws of nature” (Shepherd, 2010 p. 4). The knowledge of the discipline’s history cannot be omitted, since in order to improve a technique there is a need for the apprehension of the theories of the past contributors. The cosmos of neural studies and the study of the complex brain always fascinated philosophers, practitioners and psycologist with all trying to unravel the encephalic Ariadne's Thread. The historic mind journey started from ancient Egypt and ended in the era of the 21st century. An establishment of a conceptual framework was attempted. The scientific background of neuroscience in HR development will be presented in the following section.

4. Neuroscience in the workplace

The interest of Academics in discovering the ways of neuroscientific implementation in organizational settings are under the umbrella of organizational neuroscience, organizational cognitive neuroscience, or social cognitive neuroscience in organizations. These terminologies are used as frames of reference for the inter-disciplinary standpoints of organizational studies. These researches "take as their foci of study the cognitive mechanisms that drive human behaviors in response to organizational" manifestations (Senior, 2015). Their curiosity is triggered due to the constant flux of the competitive corporate word, and because of the fact that people spend a large quantity of their life in working environments. This approach aims in the better understanding of human cognition in specific settings.

Recent developments in technology have enabled researchers to investigate the encephalon in-real time by using a variety of tools such as functional magnetic resonance imaging (MRI), positron emission tomography, electroencephalograms, and wave analysis. Through their insights they are attempting to decode the human way of perceiving the world. The accumulating knowledge has been entering into practice while multiple articles underline the abundance of advantages that the neuro-techniques offer.

The addition of "neuro" indicates a unique analytical framework for terminologies linked to social, psychological or philosophical cases. Neuroscience is one of the frontiers in the study of the structures and functions of the nervous system (Zhang, 2008, p. 1). The acquired information from neuroscience offers credible data while attempting to explain the puzzle of human behavior and decode the societal engagement. The implications of neuroscientific developments in humans and in society, in a broader spectrum, have led several corporations to investigate further their potential implementation into the business world. Neuroscience is expanding steadily from the academic sphere to the pragmatic world with its implications infiltrating -among others- the modern workplace and the HR departments. The impact of neuroscience can be evident in certain areas were the HR collaborates with the wider operations and during any professional interaction.

The incorporation of neuro-strategies in HR settings could be the result of an organizational attempt to enhance their competitiveness, by turning their interest towards their backbone the employees. New ways are invented to maximize performance and new tactics aim to uncover the personnel's true potentials. Companies along with public organizations are evolving and tend to create and maintain extremely effective cultures, while they search to find the best recipe to influence the personnel to greatness. Neuroscience promises to reach that superiority.

However, the applications of neuroscience into workplace should not be considered as a checklist implemented automatically. Their use should be based on the judgment of the leadership in order to engender rational, just and balanced results applicable in each particular situation. Nontheless the proper use of neuro-tecniques in the workplace is expected to improve cognitive functions, augment employer/employee and client relationships, enhance job satisfaction, and reduce employee absenteeism and turnover (Schaufenbuel, 2017).

What are the reasons behind the fact that corporations and any kind of organizations are putting great effort in the development of their HR? The significance of the human factor in the industrial setting is analysed in the following section.

4.1. HR development and the contribution of cerebral knowledge in fostering organizational performance

HR development is a vital area of any organization as it offers competitive advantage and contributes to employee's engagement and retention. It is an employee-centered framework which aims to develop and enhance the personnel's skills, knowledge and abilities. The focused modern strategies include ideas for innovation, quality and continuous improvement, as well as other critically important inputs needed to compete in the modern, highly competitive business world (Swart et al., 2005, p. 3). The importance of HR is so great since it is the only part of the organization which cannot be copied, and it is the source of organizational revolution.

HR development can be seen as a supportive mechanism designated to provide all the needed information for employee adaptation to the organizational culture and to offer current and future personnel development. It is responsible for identifying performance gaps, assisting in the achievement of short-term and long-term career goals, and supporting leadership development programs. The main goal of its processes is to create a superior workforce for accomplishing both the employee's and corporation's objectives. Its practices include employee training, employee career development, performance management and development, coaching, mentoring, succession planning, key employee identification, tuition assistance, and organization development (Heathfield, 2019).

HR department is one of the key components for higher productivity, better relations and greater profitability for any organization (Ganiha and Nayak, 2007, p. 14). It represents a balancing mechanism between the needs of the employees and the corporation. HR development's philosophy is learning oriented by evolving competences and avoiding employees' stagnation, while creating inter-dependent and inter-related structures. Usually this process is equipped with an acceptable performance appraisal system were a sense of pride and achievement is fulfilled, while working in a respectful and trustworthy environment. Additionally, it aids in the improvement of team spirit and the better use of resources. For the constant

amelioration of its policies HR development collects practical and objective data on employee programs.

The major trends of this department is to better use the available knowledge and technology to enhance employee's involvement, fight unconscious bias, improve the essence of training, expand its concept of wellness, and streamline HR operations with artificial intelligence (Moran, 2018). All these developmental practices will be able to combat the constant organizational changes.

4. 1.1. Neuroscience as a tool for integrating continuous change

By understanding the organizational and cerebral functions business developers could enable effective interventions that create the right context for change (Pillay, 2011, p. 5), while the use of a personnel with high emotional intelligence could create a working place centered in the employee's wellbeing and growth. A motivated well-qualified personnel can contribute to more effective results while providing the organisation with inventive ideas contributing thus to the overall competitiveness.

Businesses and public organisations function in an environment that entails an everlasting change. New challenges arise every day and may lead to behavioral change of stakeholders and employees in order to reach organisational success. However, usually change is perceived as a threat and registered as such in the human brain. A common phraze they might use when they are challenged to learn something new is : "you cannot teach an old dog new tricks". People tend to cling on prior mind sets and old habits, not being able or even refusing to comprehend that the brain can change even in adulthood (Pillay, 2011, p. 8) and literally rewire itself. Such resistence could be surpassed by the use of the latest breakthroughs in neural research, which offer alternative approaches to organizational development.

4.1.2. Impact of Neuroscience in organizational performance

Knowledge from the fields of Neuroscience is already been used in HR management as a way of embelishment of the existing approaches. Decoding the human brain and how it reacts in various conditions enables HR management to estimate a person's behavioural path and to adapt HR techniques in order to achieve ideal results.

The following segments will exhibit the ways which an emotionally intelligent HR could boost performance and employees' well-being while presenting the requirements and setbacks of this practice.

4.1.2.1. Support and motivation of the personnel through emotional intelligence and self regulation

The corporate interest and more particularly the interest of the leaders is little-by-little shifting from results-orientation to relationship-orientation (Boyatzis, 2016, p. 1).

When a leader is reaching for a relationship-oriented management, he focuses on the fulfilment of their employees on their role and on their wellbeing while corporate goals are achieved via relationships (Watershed Associates, 2020). The importance of supportive and motivating relationships relies on the fact that they can foster the possibility to be open in new ideas and to enhance social orientation of others. When a leader focuses on better relationship environment he enables greater and more innovative performance, which leads to bigger results. The impact of positive interactons within the workforce was researched back in 2016 (Boyatzis, 2016, p. 2) when he conducted an experiment which revealed that the recollection of positive experiences in the organizational environment remarkably activated fourteen (14) regions of interest in the brain, including attention and mirror system. Negative interactions on the other hand activated only six (6) regions, while deactivating eleven (11) other. Within those six (6) activated regions were the areas linked to narrowing attention, with less compassion, and negative emotions. Performance improvement could be achieved by understanding the physiology of emotional intelligence and by regulating our emotional responses. The term emotional intelligence is referred as a set of skills hypothesized to contribute to the accurate appraisal and expression of emotion (Salovey and Mayer, 1990), while "emotional regulation is the process by which individuals influence which emotions they have, when they have them, and how they experience and express their feelings. Emotional regulation can be automatic or controlled, conscious or unconscious, and may have effects at one or more points" in the process of emotional production (Gross, 1998, p. 275).

According to Achor (2010): "For success to occur happiness must pre-exist". The cultivation of positive brains contributes to exceeding motivation, efficiency, resilience, creativity, and productivity, which then uplifts performance. It is a fuel for achievement, since happiness maximizes the brain's capacities. The encephalon is literally designed to perform at its best when it is positive, and not when it is negative or even neutral (ibid, p. 23). A possible training of the brain to focus on positive aspects could lead to the harvest of this biological advantage. It is estimated that a period of time of roughly 20 days/one month is necessary to learn new behaviors and make them routine (Salati and Leoni, 2017, p. 27). The ability to adjust the mindset and to find happiness even in harsh situations by focusing on finding possibilities 7 is something that could be cultivated. Thus, any opportunities which may occur can be seized.

Emotionally intelligent behavior has a neurological basis (Waldman et al., 2011, p. 1098) related to emotional regulation in self and others, emotional expressiveness, and empathy. Emotional intelligence can be used to inspire others and can steer emotions linked to motivation, excitement, achievement and commitment towards the

completion of organizational vision. Recent research highlights the importance of emotional intelligence as a predictor of important work-related factors such as stress management, job performance, negotiation, leadership, emotional labor, trust, and work-family conflict (Valosek et al., 2018, p. 22). To piece together the contents of someone else's mindheightened self-awareness is needed. Self-knowledge and goal fulfillment can be achieved through a biologically informed humanism (Butler and Senior, 2007, p. 3). The translation of another's emotions and intentions can be realized by the use of oneself as a template (Zaki and Ochsner, 2011, p. 14); the more the common traits with the other, the better the assumption. Acknowledging the fact that others have independent thoughts and separating our own minds from the others would lead to a more accurate prediction. Moreover, empathy could be considered as a mechanism, allowing humans to interpret other people's feelings. Often emulating other person's behavior, empathy circuit could be used as a way of learning. The knowledge of the other individual's feelings and our placing in their position could indicate their next move. Equally important in this attempt is culture, which dictates some of the choices. The deeper awareness of a researcher on the multiple theories of culture, the easier is for him to determine which decisions would be more acceptable and in which ways a proposition would be more appealing.

Emotional regulation could be used in order to influence others either by motivating them because they convey positivity or because they are contagious and engender positive emotions in followers that guide their behavior (Waldman et al., 2011, p. 1098). By limiting negative unconscious emotional states, the transmission of desirable emotions would be achieved. To modify an emotion first the individual needs to identify it. After the emotion is clear, the person should imagine been from an observer's perspective (Hurst, 2020). This will diffuse the feeling drastically. Additionally, reframing a negative situating by changing its meaning and focusing on the positive aspects, will enable the promotion of clear thinking. Positive emotions stimulate adult neurogenesis, a sense of well-being, better immune system functioning, and cognitive, emotional, and perceptual openness (Boyatzis, 2016, p. 5). Such competence could enable better communication of corporate vision and greater group collaboration. Emotional regulation could be expressed as anger suppression or behavioral inhibition in emotional responding (such as -but not limited to- facial expressions, verbal remarks, gestures). In order to obtain the ability of emotional regulation, the process of cognitive reappraisal takes place. More specifically, the strategy of adjusting the meaning of a situation could enable motivational inspiration and maintenance of calmness during times of crisis. It should be noted that the regulation of emotions requires more cognitive control (Waldman et al., 2011, p. 1999) and can occur after experiencing an emotion.

4.1.2.2 Setbacks of malpractice and requirements of an effective emotionally intelligent HR

Having obtained neuroscientific knowledge, HR practicionnairs could focus on emotional triggering of attachment and growth, since wrong practices could activate emotions of avoidance, such as fear. These emotions would trigger the sentiment of survival, rather than thriving and would be counter-productive for the organization. The mastery of emotional transmission could be manifested during the provision of feedback. Delivering feedback, even if it is negative, fosters a positive mood in teams. The moment a person expects to hear tremendous negative news, "hormones may be secreted in the brain that literally make it impossible for him to comprehend most of what is being said or presented" to him (Snyder, 2015, p. xiv). On the contrary, when people experience positive feelings, they tend to perform better (Goleman and Boyatzis, 2008, p. 76). The power of emotions could be summed up in the phrase attributed to Carl W. Buehner : "People will forget what you said or what you did, but they will never forget how you made them feel" (Seales, 2017).

In the working culture especially in the public sector where the hierarchy and the discipline are far more expanded than in the private sector, the sentiment which usually outweighs the others is the one of fear. As an emotion, fear is easier to be triggered, since it is linked to survival[11], and is often used as a management tool for motivational purposes. However, this strategy is unhealthy and invariably destructive of both people and businesses (Brown et al., 2015, p. 1) according to neuroscience. A working environment based on fear, on orders and on delimitation of power, restricts the organizational growth possibilities to just surviving. Such organizations are becoming increasingly insufficient in efficiency, competitiveness and inventiveness. On the contrary, when an organization aims to create a non-fearful and -stressful working environment, employees are thriving as they are inspired to take risks, to think "out of the box", to challenge the status quo, to explore new frontiers, to be curious and inventive, to stand up and be counted (ibid, p. 2).

In stressful surroundings the person's reasoning and cognition is affected. Even though in limited levels it can ameliorate thinking and other mental functions, if it is overwhelming it may paralyze the mind's critical abilities (Goleman and Boyatzis, 2008, p. 79). Instead of focusing on the given task, attention is drawn on the perceived threat. This tension is communicated throughout the team and the catastrophic emotion spreads in the entirety of the group and its performance.

An emotionally intelligent HR management department would be able to determine the motivational forces of its personnel regardless their background. It will also have elevated sensitivity towards the employees' needs while being able to listen actively

[11]The basic universal emotions and their responses are depicted in Table II in the appendix.

and adjust its approach. Furthermore, it should have an extensive knowledge on the culture and values of the employees and at the same time have the awareness of unwritten norms. Via constructive dialogues it will have the capacity to persuade the team by appealing to its interests, and allying it to the corporate goals. Gifted with persuasion skills it will have the ability to acquire the support from key people. Coaching and mentoring will be at their everyday tasks, showing extra attention when feedback is delivered. Always been a bay of positive emotional tone setting and a source of team pride building, it will be able to bring the best in people while leading them and articulating the corporate vision. Finally, it should seek input from each member of the group and support cooperation. Having accomplished all the above, it will transform itself to a beacon of inspiration and innovation, transforming the whole corporation into the best place to work where each employee would be happy to contribute to its success, while the feeling of happiness will act by itself as a supplier for the aforementioned success; thus, creating a circle.

The application of neural methodology in the organizational settings for the better assessment and understanding of human behavior could be implemented from individuals and teams to the whole organization or at any interorganizational level. It could be used as a tool to understand an individual's mental state, especially when staff may not always want to report the state that they are in (Butler and Senior, 2007, p. 7). The accurate outline of the employees' emotional state could enable a proper response and create a more targeted supportive approach during the coaching process.

This field can augment the understanding of human interaction within the organizational framework. Genetic settings can determine interests, work-related values, job satisfaction and job turnover (Arvey, 2016, p. 174) by influencing individual qualities, such as inclinations and psychological traits. Genes can also create a tendency toward environment selection and societal role selection, which subsequently influence the person's behavior. On the other hand, hormonal factors can affect individuals' viewpoints toward competitiveness, justice, and trust that may influence in turn the corporate process of decision-making.

The current segment revolved around the theoretical setting of neuroscience in the organizational framework. It seems that along with corporations HR practices are evolving with the use of advanced technologies and existing knowledge as an attempt to adapt to the complexities of the business environment and aspirations of the stakeholders. The study of processes in the human brain that allow people to understand others, understand themselves, and navigate the social world effectively (Waldman et al., 2011, p. 1093) could be proven useful within organizational settings. Although strikingly few neural studies exist on HR development, a considerable use of their techniques seems to be an interesting voyage full of opportunities and challenges.

The next chapter will be dedicated to the practical use of the accumulated knowledge in the field of HR development and in demonstrating the useful infusion of neuroscience in the HR development in areas such as employee selection and retention, personnel profiling, and employee's proffessional development.. Furthermore, the presentation of an organisational example will be utilised.

5. From theory to empirical implementation:

HR development under the prism of neuroscience

The present chapter will contribute to the better understanding of the application of the neural toolkit into the workforce and more specifically into the public sector. For the better understanding of these technical capacities an example will be provided as an illustration of this empirical underpinning.

5.1 Adapting neurotechniques onto HR strategies

"Modern times" call for "modern measures". In face of the uncertain world more and more organisations attempt to incorporate a biological perspective in order to manage and influence their personnel to achive the desired aims. The use of neuroscience into their organizations promises the enhancement of predictability and efficiency. However, in order to achieve successful interventions, both during the plannification and executional stage, an accurate understanding of these mechanisms is mandatory (Colareli and Arvey, 2015, p. 6). The strategies of HR development include the acquisition, development, management, motivation and commitment of the working force. Inspired approaches from the field of Neuroscience can aid, enhance the effectiveness of HR management policies and empower the personnel by offering all the latest trends and support needed.

5.1.1 Recruitment

Any talent management and development program is essentially built upon an effective recruitment process. The recruitment of newcomers can be proven a challenging task since unconscious biases can affect the final selection and poorly executed personel acquisition process will affect the organisational success. If not done properly, attractive job candidates -including those who work for competitors- will be missed because they never found out that a position was open (Breaugh, 2009, p. 1). An optimized talent hunting process will equip the existing personnel with the relevant skills and abilities and will lower organisational costs, since time and money from training and replacing new hires will be omitted. Supplementary processes based in neuroscience could enhance the end result and create a successful hiring.

First of all the unconscious mind could be reached by appealing to the reptilian part of the brain, which is responsible for the automated processes and instinctive reactions. A direct hit to the dopamine hormone could augment the applications for a job post (Beamery, 2020). Visual portrayal of the organisation would enable the person to understand the culture without the verbal transaction, while letting the candidates know about the available developmental possibilities will result in them

been focused on the ultimate goal. By envisaging their future in the organisation and their endless possibilities for wellbeing and development, they will be engaged and thrilled to join the corporal family from day one.

The understanding of cerebral management during stressful events can enable the interviewer to ameliorate the process' ambiance. A warm handshake or even a slight touch -as long as it is culturally and socially appropriate- increases oxytocin, the neuromodulator related to forming bonds (Sasscer-Burgos, 2014, p. 37). Incorporating familiar rituals increase serotonin and allow people to relax. In order to establish further connection in the emotional and psychological level a comfortable chair and a warm beverage offered could be a good starting point for the interview (Beamery, 2020). Furthermore, technology could help in the first steps to surpass any biases. The diversity which could introduce would expand the talent pools which include people from the autism spectrum who are underrepresented in most enterprises. Such individuals are exceeding in some areas, like mathematics, technical proficiency and facility for details (Thibodeaux, 2018). A proper training to the newcomers and the existing personnel would create a better sense on how to work with the new hires most effectively (ibid).

5.1.2 Learning and training

The biological forces could be activated during other aspects of HR development, such as employee career development via training. Training within the realms of the corporation can result in both short and long term benefits. After targeting individual training needs, a proper educational plan could allow the fortification of the skills leading to greater employee performance, satisfaction and retention. The combination of organizational and employee interests (Chaghari et al., 2017, p. 26) with care and emotional resonance (2020 Accenturea, 2020) could also provide consistency, eliminate any weaknesses through the workforce, enhance qualitative and quantitative results, introduce innovative thinking, reduce employee turnover and augment the company's reputation and profile (2020 Project Management, 2020).

During the training setting the educator may encounter certain difficulties. The first enemy of adult training is discouragement. When the individual feels that little or no progress is achieved, then frustration arises. In order to avoid this progress track certain tactics should be employed. Another setback may be the weakening of neural connections due to disuse or age (Strauch, 2009). This results in lack of attention, fatigue and lower levels of information receipt. However, if the individuals keep challenging their brain the neural generation will be promoted and the pathways will result in better knowledge acquisition.

In order for a person to obtain and maintain knowledge and skills setting a considerable amount of effort is required. The transition from the working memory to

the basal ganglia at the base of the brain requires a lot of energy and consumes glucose (Graham, 2012). For this reason the person may feel worn out during and after a training session. To combat this, the trainer could suggest healthy meal consumption one hour prior to the session in order to maintain the glucose levels intact. To stabilize the memory trace and achieve memory consolidation the trainer could suggest the person to have the right kind and amount of sleep after their session. «As it seems regional cerebral blood flow measurements, hippocampal areas are activated during route learning in a virtual environment are likewise activated during subsequent slow-wave sleep» (Peigneux et al., 2004, p. 536) and results in the amelioration of the performance on the task the next day (Squire et al., 2015, p. 6). To retain the received information the trainer can encourage the trainee to take small breaks from the training session. A break could be a small talk with a colleague or a short walk. In this way the focus and training engagement will be increased.

Another way to maximize the cerebral capacity to retain knowledge is through the use of the proper environmental setting, such as the music or color in training programs as a practical implementation of neural influence in the service of organisational arena. It can create an ambiance where the person feels calm, secure and accepted. Another technique which could be utilised during learning sessions could be the power of imitation and influence, since knowledge transmission is not necessarily limited to language. The importance of the environmental surrounding and the use of mimicry will be analysed in later chapters.

Frequent group interaction tends to the creation of member convergence toward attitudes and behaviors (Becker and Cropanzano, 2010, p. 1057). In order to take advantage of this phenomenon, corporations should have top and middle-level leaders to act as role models and inspirational source. They will be transformed to "key figures" within the organization, since they are between the crossroad of the company’s processes and the mental and emotional processes of the industry (Salati and Leoni, 2017, p. 27). Employees with positive predisposition would also have a constructive impact within the corporate’s culture. These practices would ensure that the desired behaviors will be modeled by prominent members of each group (ibid). Any existing negativity or undesired behavior within the members of the workforce should be addressed with constructive training and consultation in order to rewire their neural paths.

Non-verbal influences should be reinforced with the use of proper wording. When a message is conveyed either in written or verbal form, it should be communicated clearly and in a positive tone. This type clarity would store the information in the encephalon in a clear manner and confusions would be avoided. The clear communication of the requested task will result in the understanding of what is expected from the personnel and the threat reaction will not be activated, therefore

performance will not be affected. What is more, in time employees will mimic this sort of communication themselves either by conscious choice or by unconscious forces.

In the service of trainers NLP strategies could provide a more intervening strategy for influencing thoughts and emotions with the aim to aid the individual's learning processes.. Although they are considered demanding techniques, if performed accurately, they can transform the person's entire life by reshaping the way of the person's experiencing the world. One tool in the trainer's toolbox includes the creation of anchors to form an association of a positive emotional response with a particular phrase or sensation (Hurst, 2020). This skill is created in the spirit of conditioned learning, a method created by Pavlov. Pavlov was an investigative psychologist who developed his theory based on his studies on dog behavior. In order to test his hypothesis on an effective learning procedure grounded to pairing stimuli with a conditioned response, he conducted an experiment by presenting a sound stimulus while feeding his dogs; after some repetitions, the dogs salivated in response to the sound stimulus without the presence of their food (The Editors of Encyclopaedia Britannica, 2015). Apparently an association of stimuli based on senses could lead to instinctive behaviors.

Inspired by this experiment a person can create a condition, were a simple trigger can bring forth the desired emotion. To do so first a certain emotional state must be defined. Then, the individual should decide where to position the anchor on his body. An anchor could be anything from scratching his head to touching his earlobe. The trigger should be unique and not utilized for any other purpose than accessing the desired feeling. For the creation of this mechanism the person should concentrate into a past state were the wanted emotion was experienced. While mentally reliving that state the body language should be adjusted to coordinate with the experience. This mental travel will enact the past feeling. It is during the emotional peak, were the person should touch/pull/squeeze the chosen corporal area and release the feeling begins to wear off (Hurst, 2020). The addition of another memory of the same experience state would enhance the response to the anchor. This technique essentially creates a neurological stimulus-response which is available for the person's use whenever he feels it is needed.

The implementation of effective learning initiatives can contribute in retaining knowledgeable workers (Breaugh, 2009), who will –in their turn- lead the corporation to successful paths. The human capital is the source of competitive power, since it is the root of productivity and innovation. A perfectly designed HR development strategy can bring fourth immense possibilities and capabilities within the workforce, especially by using techniques deriving from neuroscience as a supplementary material.

A trained workforce is equipped with new skills, improved production, limited time for the end result, reduction of costs and errors, augmentation of corporate trust and amelioration of the working environment (Benton, 2014). Among the existing available techniques new ones are incorporated. In this endeavor communication plays a crucial role and is considered as an important element of HRmanagement. The following section will revolve around some techniques regarding the improvement of communication.

5.1.3 Communication channels, NLP, goal setting

One of the important elements for a successful organistional strategy the effective communication of the corporate aim. Nontheless, communication and transmission of organizational policies from management towards the employees should be organized and carried out strategically (Raupp and Hoffjann, 2012, p. 146). A clear outline of it could enable the better understanding of the personnel on how their assigned duties affect the bigger picture. When the required message is effectively conveyed any potential confusion will disperse while the amelioration of the «proletariat» efficiency will be achieved. For the proper mediation of new information standard in-person encounters could be proven fruitful.

During the consultation process communication strategies are crucial, since consultation and conversation would not have the desired results if the consultant would not listen actively. Active listening is the receiver's attempt to assist the transmitter's effort to express and convey in the right way his thoughts, while at the same time helping him understand and feel how the transmitted message is received by the receiver (Bourandas et al., 1999). Some indicative techniques of active listening include the use of non-verbal communication, the utilization of pauses, the use of clarifications, the repetition or paraphrasing of the other person's wording, the focus and classification of the discussing subject and the conclusion of the main parts of the conversation. Active listening enables the person to understand the emotions, needs, biases and values of the other. While listening, the receiver should use his heightened emotional intelligence to comprehend the other person's situation.

An individual equipped with cerebral techniques could use them to build rapport with the others. The key is to trigger the other person's mirror neurons by subtly mirroring the other person's body language, tone of voice, and words (Hurst, 2020). By facilitating through mimicry with a delicate manner the other person will start to have a sense of the desired feeling. According to Bourdieu mimicry is performed when an unconscious individual imitation of other person's actions (Sieweke, 2014, p. 25). These subconscious cognitive schemata have the ability to be conveyed from one person to another potentially due to the existence of mirror neurons. "Mirror neurons are a class of neuron that modulate their activity both when an individual executes a

specific motor act and when they observe the same or similar act performed by another individual" (Kilner and Lemon, 2013, p. R1057). This neural class enables humans to interpret and understand the intentions and actions of others by involving the person's own motor system (ibid). Through this generative mechanism, the person can elucidate the other's mental (Becker and Cropanzano, 2010, p. 1057; Becker et al., 2011, p. 938) and emotional state, rationalize their actions and imitate them in terms of his own movements and goals (Thomas, 2012). Responds to dynamic motion, facial expressions, sounds and goal-directed actions of proximal others can enact the mimetic effect. These social drivers can influence the person's neural wiring especially in occasions where the person is not familiar with a specific social interaction or the surrounding environment. They seem specially tuned to respond to actions with clear goals (Thomas, 2012). However, this technique should be done carefully so that the conscious mind will not identify the attempt and the rapport will be maintained. Therefore the mirroring effect should be done in a calm and natural way.

Consequently, the verbal messages should be manifested with the proper phenotypic and dynamic cue. If the received information contradicts the nonverbal expression (Nešic and Nešic, 2014, p. 31) then the latter will be considered as genuine since it is more uncontrollable. When thinking and wording is aligned with actions, then the person's intentions are becoming more accurate. Effective communication can be challenging, since each brain is wired based on each person's culture, social role and past experiences. A speaker's linguistic choices are influenced by those of his interlocutor and, when these coincide, postural coordination increases (García and Ibáñez, 2014, p. 2). During a social interaction, phonological modifications are made in order to reach encephalic synchronization.

In order to combat such situation, the person must be willing to practice to override negative thoughts and maintain sereinity. Misunderstanding can be avoided when the interlocutor transmits the information as clearly as possible, giving examples and explaining the gains deriving from the new update. Rephrasing and repetition could clarify any obscurities. If tension builds up the conductor could acknowledge the existence of concerns and de-escalate the situation. With this tactic the participant will feel that he is being heard (Sasscer-Burgos, 2014, p. 43) and a recognition of the negative thought would help to its self-modulation by finding the source of the emotional reaction and engaging the prefrontal cortex to slowly influence the limbic system to reinterpret the data (ibid, p. 24). This readjustment of experiencing the external world and the conceptual thinking can be accomplished through neurolinguistic programming techniques (NLP), which can reveal the best version of one self and can influence others. Techniques based on cerebral strategies can

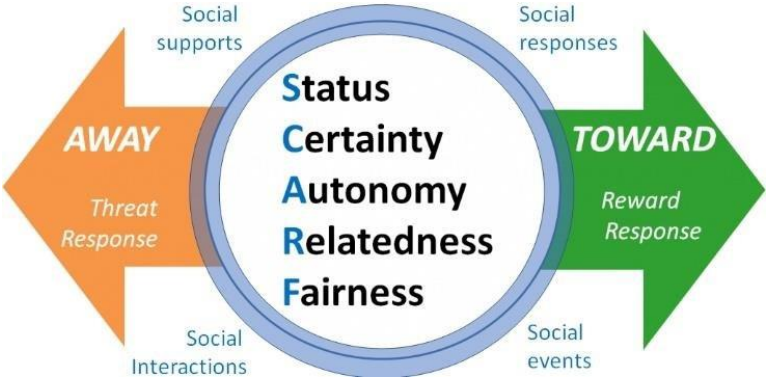
contribute to performance augmentation while the well-being and the overall sentiment of contentment towards their jobs.

One useful tool deriving from NLP practices is the use of Ericksonian hypnosis. A method developed by Ericson in order to influence and persuade others or to overcome narrow mindedness, anxiety, and phobias. More specifically, Ericson found a way to tap into the subconscious through conversations and influence them with indirect suggestions (The British Hypnosis Research & Training Institute, 2020). He made his clients feel valued and with numerous tactics he was catching them off guard and was able to open the unconscious mind for change (ibid). Tactfully he was able to plant a seed in to the other's subconscious through the use of humor, metaphors, antidotes and contradictions. His subtle manipulations could lead the patient to institute constructive behavior from within, often without full conscious awareness (Beahr, 1971). However, this technique has ethical boundaries which should not be crossed. In general, the content of the interpersonal meetings should be simple, relatable and in different formats in order to enhance the person's attention.

The attention span of an adult, according to researchers, is approximately 10 to 20 minutes with a possibility of promoting higher alertness with the use of certain techniques (Bradbury, 2016, p. 510) which can combat mental fatigue. However, it should be noted that this time span has not yet been quantitatively defined and that several published researches are based on "the same single initial report" (ibid, p. 509). When communicating the goals they should be prioritized according to their importance. This social engaging should be done in a positive tone. Following the acknowledgement of any potential achievements, the aims of a corporate project should be laid out and any suggestions from the employee towards the completion of the objectives could be requested, making him feel valued and enhancing their engagement. The recognition of their efforts and the understanding of the project goals could ignite the business growth in the long-run.

In order to minimize perceived threats and maximize rewards when communicating a goal or a change in practices the SCARF (Eddolls, 2015) tool could be used. SCARF is a model of social threats and rewards and is an acronym for Status, Certainty, Autonomy, Relatedness and Fairness. Status is linked to hierarchy and is linked to the person's feeling of self-worth according to his position in the hierarchical schema. When the person feels that his status is threatened then his behavior would be negatively affected. Certainty is related to predictability, since familiar situations use less brain power than in the opposite reality. When the accustomed status quo is challenged, the person's stress levels arise. Autonomy concerns the individual's feeling of control over his surrounding environment. When this sense is taken away, anxiety emerges. Relatedness is all about the feeling of safety within the group, while fairness revolves around the sentiment of fair exchanges. If this perception exists, the

reward center is activated. An illustration of these perceptions and their response triggering is presented below:



Source: Li and Fong, 2019.

In corporate settings this tool could be used to promote a better performance and to eliminate resistance in change. Helping personnel to envisage the changes and their implications, while trying to indicate what is expected by these practices in the future would lower the potential sense of threat. When the received information is unaccustomed or ambiguous, there is a high probability to be interpreted unfavorably. Negative emotions could arise and misunderstandings may occur. The perceived threatening results in the release of stress hormones which cloud the person's judgment. Instinctive corporal preparations, such as increased heart and rapid breathing, are made in order to lash an attack or flee if necessary. Complex decision-making disappears; attention narrows and access to multiple alternatives vanishes, as the amygdala immediately shuts down the neural pathway to the prefrontal cortex (Hamilton, 2015). Emotional stress immediately inhibits areas of the brain related to memory and complex thought, and triggers the hypothalamus–pituitary–adrenal axis that releases stress-related hormone (Saslow et al., 2013, p. 257). Creativity is crippled, cooperation is inhibited and informed decisions are obstructed. Uncertainty arises and paralyzes people's ability to perform (Rock, 2009).

Furthermore, the employees' engagement in these structural alterations would make them feel secluded and would allow them to have a sense of control. If needed the corporate leaders should provide support and incentives while placing goals. Important element in this endeavor is that the leader remains calm and relaxed when introducing the changes. Be self-aware and modulate his behavior to reduce organizational stress and create a surrounding where creativity and motivation thrive.

Goal setting will also allow the alleviation of procrastination, a self-defeating behavior that involves putting off actions that should be performed promptly (Becker and Cropanzano, 2010, p. 1056). While posing a goal, the ability of the corporation to compute explicit, reportable information about the aimed objectives should be

enhanced. Breaking the employee's comfort zone is not an easy task, since the habit-based decision-making system produces positive emotional states and stimulates the rewarding mechanisms. To obstruct employees from staling, the corporations should set small targets with the aim of achieving a higher purpose. Those who have made adequate progress could be rewarded with financial or non-financial incentives. In this way the brain would be rewired, since procrastination would not provide the expected results. A structured plan and a high level of discipline allow the accomplishment of more tasks and gives the person control over his time. When a target is set drifting away is more unlikely and a choice of changing direction would be made after conscious thinking. S.M.A.R.T. goal setting would be a great tool to set and reach corporate goals.

However, even with the most sophisticated techniques of communication and the clearest goal settings, corporate aims might not be met if the proper incentives are not given to the employees. The following sections will revolve around the importance of motives and evaluation, and how to ensure optimal working environment for boosting employees' well-being and job satisfaction while achieving corporate goals.

5.1.4 Incentives

A holistic process of HR management cannot exclude reward strategies. A structure of benefits and acknowledgements which is well-established is essential for the accomplishment of the aiming motivational level within the workforce. Every incentive is based on the person's needs. Needs initiate and steer the person's activities "until the goals that generated them are reached" (Badawy, 2007, p. 60). Therefore HR managers should either address the needs of the employees or create new ones. Incentives could either be tangible or intangible. Depending on the level of performance, motivations could be done in monetary terms, such as merit increases, bonuses, incentive schemes, profit sharing, or non-tangible recognition through contests to determine the "best employee of the year", the "best sale of the year" (Wursten et al., 2011, p. 1), This kind of motivation is given so that the employees' practices will shift around the wanted behaviours and should be given soon after the desired occurrence of behavior (Badawy, 2007, p. 64). Such motivational forces could give a sense of purpose within the personnel, resulting in the completion of the corporate aims.

Human motivation could be simplified down to just four fundamental drives—acquire, bond, innovate, and defend (IRF, 2017, p. 17). People need to acquire assets, such as money, and achieve goals such as the acquisition of status and skills. Due to the fact that humans are social animals, they need authentic caring relationships (ibid). Finally, they need to learn, create while feeling safe and secure. The

responsible hormone is dopamine which is released during achievements. In essence, it makes people craving achievements (ibid, p. 19).

Incentives could be considered initiatives from corporations which offer free gym memberships, healthy food options, resources for expanding the individual's knowledge, discounts, coaching for reaching one's goals and programs designed to boost health (Microsoft, 2020). All these actions stimulate the reward and pleasure centers of the brain while making the person feel secluded and valued. In order to achieve optimum returns from their human capital other corporations offer free meals and transportation to work in an attempt to minimize stress. For example, TD Canada Trust, a Canadian bank offers, among others, naturopathic services with professionals examining all aspects of an individual's health (physical, mental and emotional), and teaching him about naturopathic medicine and how it works (TD Canada Trust, 2020). Additionally, they organize entertaining events outside workplace [such as Tree days were employees plant trees (https://www.tdtreedays.com/)] where employees can bond, securing thus better group cooperation. All these actions are aiming to the flourishing of job satisfaction and the creation of high-performing individuals which are considered critical for a business success. A major motivational force could also be the creation of an optimal working environment where multiple factors are taken into consideration. The following section will present briefly the ways which could be utilized in the working environment in order for the promotion of employees' well-being and performance to be achieved.

5.1.5. Working environment and neuroscientific tools

In order to heighten the personnel's positive evaluation of their work environment, corporations turn to the insights from neuroscience which can navigate the physical environment so that the person's cognition, problem-solving ability, and mood (Sternberg and Wilson, 2006) can be affected positevely. One example of the effective implementation of the knowledge from the neuroscientific realms onto indoor designing is Atrium 1 which will be presented at a later chapter. Since the encephalon responds to stimuli and is shaped by the external environments, factors like light and spatial layout can play a major role in the person's physical and psychological well-being. Research projects have shown that natural lighting and ventilation systems enhance positivity on the workplace and are significantly related to workers' satisfaction and productivity (Hameed and Amjad, 2009, p. 8). **Natural light** can positively affect the mood and productivity of employees (Hameed and Amjad, 2009, p. 5), while a better indoor air quality (low concentrations of CO_2 and pollutants and high ventilation rates) can lead to productivity improvements of 8-11% (World Green Building Council, 2014, p. 8). Thus, companies could ensure that the working environment is properly illuminated both by artificial and natural light

(Vischer, 2015), and that adequate ventilation is installed, so that the office design would be improved and better employee performance would be secured.

Indoor air quality is linked to the person's health and if taken into consideration, many diseases such as flu can be prevented. Additionally, proper ventilation system can stimulate an employee's creativity, sense of purpose, and focus (Pochepan, 2019). Another way to boost the person's state of mind is by allowing greater environmental control, such as thermostat adjustments or furniture re-arrangement. Natural elements within the premises, such as indoor plants and sunlight exposure, are related positively to job satisfaction and organizational commitment and negatively to depressed mood and anxiety (An et al., 2016, p. 1). The proper utilization of these inexpensive physiological and psychological boosters may increase attention span, reduce mental fatigue, and support recovery from illness while acting as a calming instigator (ibid, p. 2). A nature-friendly work environment may include plants, view scenery or representational elements, such as paintings of nature.

An important role in the interior design is played by **color.** Researches indicate that the right color selection can produce systematic physiological reactions which may, in their turn, be expressed in emotional experience, cognitive orientation and action (Elliot, 2015, p. 1). The right combination of color selection may have a positive impact on the personnel. A colorful office environment seems to enhance performance and space appraisal more than an office with an achromatic scheme (Öztürk et al., 2012, p. 360). Although, the white setting was thought to be more formal and harmonious (ibid, p. 363), the level of errors increased significantly (Kwallek and Lewis, 1990, p. 277). Green color could be considered as a wise option for a corporate setting since as already stated representational elements of nature can be associated with calmness and happiness. The selected room color should be complementary to tasks requested in the given premises and should take into consideration the surrounding environment (Thatcher and Yeow, 2018, p. 176), since the person's perception could be affected.

An example of how their perception could be influenced relies in the theories of color psychology. The knowledge of color has been utilized many times to affect the mood of the individuals. Notably, mood can be affected by a variety of factors, but color will be selected for this illustration. Colors can encourage the creation of many emotions such as calmness or stress. The correct selection of color can guide a person's preference and facilitate in his choice process. The targeted accumulation and analysis of unconscious behavior can affect the individuals, since the right color usage may convey feelings, such as grief, anxiety, short-temper or comfort. Under the influence of a particular color and depending on its individual's reception, the person may experience a change in pressure and appetite while a color might awaken unconscious reactions linked on the individual's personal characteristics (Brown,

2017). The understanding of color psychology can transmit the correct message and provoke the anticipating response.

For this reason color could and is been used during training sessions for the eye stimulation, since the use of the right color, and its correct selection and placement can seriously affect feelings, attention, and behavior when learning (Color psychology, 2020). In brief, green color can improve concentration, orange color increases the perception of comfort and improves neural functioning and blue color may enhance productivity (ibid). Even though color may affect the individual even slightly, a generalization should be avoided, since other factors such as color trends, age, social norms, and workplace conditions may influence the perception of the color (Thatcher and Yeow, 2018, p. 176).

For the better communication of the staff, companies tend to design their layout with an **open-plan layout**. In this configuration collaboration is thought to be promoted since an employee can walk up to their colleague and communicate, if necessary, to complete a task. However, this scheme may be impractical if the noise levels rise and other distractions occur. A study by Bernstein and Turban (2018) revealed that within this spatial design the volume of face-to-face interaction decreased significantly (approx. 70%) with an associated increase in electronic interaction. From this research, it appears that in practice the concept of open workspaces instead of creating and ambiance of collaboration and equality, it triggers a natural human response to socially withdraw from team members (ibid).

The **acoustic environment** is another aspect which can either promote or inhibit productivity and well-being. When the recommended sound level of 45 dB(A) (Evidence space, 2020) is exceeded, the performance deteriorates, vital information could be missed due to lack of concentration, inaccuracies can be made, and stress levels may increase. Higher levels of stress at work are related to increased insomnia, anxiety, depression, job dissatisfaction, decreased organizational commitment and reduced job performance (Woo and Postolache, 2008, p. 185). Complementary to the impact on cognitive performance, high noises cause irritability and fatigue while the attention span drops (Jafari et al., 2019, p. 2929). Noise augments the possibility of absenteeism and promote personnel turnover (Evidence space, 2020).

When a person is working in an ambience with loud noises, it is more likely to experience negative emotions (Kliuchko et al., 2016, p. 1). It is evident that sustained functional discomfort leads to stress (Vischer, 2015 p. 13). Even though mild brainwaves can be beneficial to a person, as presented before, persistent loud commotion can lead to permanent damage of the hair cells, which act as sound receivers in the ear (Reed et al., 2014, p. e250), causing auditory deterioration. Furthermore, it can negatively affect other body organs and give rise to health issues.

In order to avoid such future implications, companies should plan ahead on how each area will be used and how many employees will occupy. Furthermore a specialist should be hired to control the transfer of noise and if necessary to install sound insulation (Evidence space, 2020). An accessible place to privacy for concentration and confidentiality (Vischer, 2015 p. 12) would also promote acoustic comfort.

The utilization of **music** in the working place is related to remission of negative thoughts and feelings while leading to th enhancement of creative expression (Bibb et al., 2015, p. 1). Music can promote the amplification of cognitive functions and can alter the function of the brain following an adequate implementation and resulting in the adaptation of the desirable behavior (Karapetsas and Laskaraki, 2016). It seems that when a person engages with music, he contributes to the further expansion of his neurons and synapses (Karapetsas, 2009). Music can access the encephalon and can assist in restructuring neural pathways and promoting neuroplasticity. With a proper musical background consisted mainly with rhythmic sounds the employees could be coordinated more efficiently in a mental level (Fields, 2012). The synchronization is a result of the ability of the rhythm to tap into brain circuits and control the brain circuitry of sensory perception (ibid).

The right tunes can support learning capacities of the individual. Brainwave frequencies relate to various levels of consciousness (Berk, 2008, p. 48). There are five types of waves- gamma, delta, theta, alpha, and beta (Brainwave Entrainment, 2020). Delta waves are related to sleep and they will not be analyzed in this study. It is possible for all the brainwaves to operate at the same time; however one of them will be the predominant from the others. This will be the one which will determine the person's current state of mind. Beta songs are usually linked with heightened level of alertness in processing, concentration, arousal, and cognition (Brainwave Entrainment, 2020). On the other hand, alpha waves can access the subconscious mind and promote a stress-free environment where alertness is still heightened. Theta songs are usually preferred for meditation. Nonetheless its use could reach the subconscious mind and promote memorization capabilities. Among others its use can reduce fear while augmenting the capacities of problem solving and creativity (ibid). The illustration of normal ranges of these brainwaves as perceived by a normal healthy brain is included in the appendix.

The proper manipulation of these tunes could enhance alertness or promote calmness. "Fast, up-tempo, major-key music can snap to attention individuals who are in a drifting alpha or meditative theta state, leaving them super alert and ready" for whatever actions the corporation has planned (Berk, 2008, p. 49). Music may also affect emotions and via dopamine secretion control the brain's reward and pleasure centers. When music is utilized in corporate environments and is promoted by directors, listening to it could have a positive effect in multiple levels, provided that

the employees are willing to do it. Stress relieve techniques can prevent the hippocampus from shrinking while plasticity-facilitating treatments could be given within the framework of a positive behavioral or physical therapy intervention (McEwen et al., 2016). Ensuring a pleasant working environment is a relatively low cost strategy which can promote cooperation and learning; prevent or reduce anxiety; enhance work productivity and task accuracy; positively affect mood, reduce burnout and turnover (Lesiuk, 2005, p. 176).

When referring to comfortable settings the quality of furniture comes in mind. In a work setting were the employee is required to be sitted for prolonged periods of time, a proper chair can prevent health issues, which are linked to abnormal strain of the neuromuscular system, a main cause for musculo-skeletal pain and discomfort (van Niekerk et al., 2012, p. 2). The repetitive nature of work can lead to increased rate of injury and illnesses, consequently increasing absenteeism. Health is an important element of wellbeing, but an occupant's sense of wellbeing is also a non-negligible factor (World Green Building Council, 2014, p. 16).

Healthy workplace practices involve taking into consideration the **thermal conditions.** Thermal comfort plays a significant role on workplace satisfaction, but it seems to return single digit improvements in productivity (ibid, p. 8). The perception of thermal comfort is subjective and usually depends on the individual's metabolism, preference and attire choice. Thermal environment is perceived as air temperature, air speed, radiant temperature and relative humidity (Shan et al., 2018). It is one of the most significant components of the indoor environmental quality, which can affect concentration, clear thinking and self-estimated performance (Wang et al., 2019). It should be noted that the mental workload varies among individuals even for the same type of task (ibid). Nonetheless, an action of allowing the personnel to control and adapt the thermal environment can lead to an increase of 0.2 to 3% in overall productivity according to a study (Loftness et al., 2003, p. 4).

Finally, for the amelioration of productivity, the overall performance, and the alleviation of stress responses in the industrial premises the incorporation of **physical exercise** could be used as a technique. A 30 minute physical activity can reduce stress while improving brain functioning. Researches indicate that exercise can be considered as a strong gene modulator which promotes structural and functional changes in the brain, causing tremendous benefits on both cognitive functioning and wellbeing (Mandolesi et al., 2018, p. 1). Exercise can act as a catalyzer against neurodegeneration, since it plays a protective role (ibid, p. 3), while producing gains in a biological and psychological level. "During an exercising session, oxygen saturation and angiogenesis (blood vessel growth) occur in areas of the brain associated with rational thinking" (Tocino-Smith, 2020). In addition, social, somatic and intellectual performance is promoted. A well exercised body ensures optimal

functioning of the brain, since regular exercise results in the amelioration of executive functions, such as emotional regulation, bias suppression, complex problem solving and flexible thinking (Swart, 2019), while releasing tension in a physical way.

Evidently, creating the perfect environment for productivity requires a lot of effort. Simply augmenting the working hours will not magically boost productivity. To the contrary, researches suggest that long working hours reduce creativity by decreasing the amount of waking hours when the mind is at rest (James, 2015). The outcomes of overtime include elevated stress, burnout (Strauss, 2016), fatigue, interpersonal relations deteriorates, misconduct appears (Vila, 2000), qualitative performance is crippled and attentiveness is negatively affected. Moreover, long working hours under stressful working conditions might have a synergistic negative effect on health (Cho et al., 2018, p. 478).Therefore, longer working hours create more difficulties and may encourage absenteeism and any mistakes done would require extra amount of time to fix than doing it correctly in the first place. This has been understood by many countries and the long-term trend was to decline in average annual hours worked per person in employment within OECD countries, while flexible part-time work has been increased (OECD, 1998, p. 153). Productivity gains have been reflected by higher average real employee compensation, hour reduction, technological advances and various incentives (ibid, p. 165). For example, even though Greece has some of the longest annual shifts on the planet, averaging 2,018 hours per year, labor productivity is $38.9 (McCarthy, 2019). On the contrary, Ireland is at the very top of the scale with a GDP per hour worked of $99.5 (ibid) even though the working hours per worker is averaging 1,772 hours per year (OECD data, 2020).

The human factor is more and more incorporated in the industrial arena, since an inadequate physical comfort can create a feeling of health endangerment among employees who will expend their energy on overcoming environmental barriers (Vischer, 2015, p. 12). This will result in underperforming due to fatigue, discomfort and the lack of concentration in their given task. Creating an employee-centered organization can lead to maximized return on investment (World Green Building Council, 2014, p. 17). By incorporating neural strategies in the workforce all participants benefit and the corporate soma reaches its full potential. Successful adaptation of the practices can result in improvement of a higher level of commitment and productivity, while maintaining the personnel’s good health, wellbeing and satisfaction. This employee-friendly environment can minimize employment cost per employee by reducing absence costs and staff turnover, higher staff retention, optimization of green building ratings resulting in higher value/lower risk/ improved reputation of the corporation, positive feedbacks and increase of company’s revenue (ibid).

However, how can someone be certain about the performance results in the industrial premises? The next sub-section will present ways of assessment which could lead to accurate evaluations and targeted training and motivational approaches.

5.1.6 Evaluation and feedback assessment

Measuring performance can be a challenging feat, due to the diversification of the tasks and the abundance of measuring mechanisms. Furthermore, even in the most seemingly objective measurements value judgments and subjectivity (Badawy, 2007, p. 65) will lurk their way through. In order to achieve constant amelioration organizations should take notice and records for every accomplishments and failures and be ready to hold accountable the responsible personnel. In order to correct one mistake there is a need to first identify it. Based on the measurements the employees should receive appraisal or reproach. In the latter case criticism should be avoided, since a mutual goal setting (ibid, p. 65) and research for a potential skill expansion through training would have greater results. Customized programs could enable HR practitioners to continuously evaluate, qualify and upskill the personnel. Technology has the ability to create innovative working environments and if used strategically it may unleash immense growth potential. It could also be used as a gatherer of unanimous data to be used as an unbiased system of feedback and assessment.

When an accurate assessment is performed it could be utilized as a proper motivational system, which will not only be centered in bonuses and high monetary gains but also in the person's acknowledgement and praise. These practices would alienate the personnel from the paths of indifference and stagnation. The evaluation process should be done in the spirit of 360º Feedback system in order to shed light in all aspects of the corporation and allow the identification of problematic areas. Some indicative tools for the 360º evaluation include quantitative surveys and computer programs such as 360° Leadership Navigator® for Corporate Leaders or 360° Leadership Navigator® for Executives (ISON Psycometrica, 2020).

Assessments could be made in order to measure a person's professional qualities and potential behavioral reactions. An evaluation based upon neuro-scientific variables may provide a more ecologically sound alternative, or at least addition to the existing psychometric assessments (Balthazard et al., 2012). Neuropsychological assessment- "the systematic evaluation of the brain-behavior relationships in an individual" (Laatsch, 2002)- can pinpoint each employee's particular cognitive and behavioral abilities. The duration of these standardized tests and processes can last from one to two days for one-to-one evaluation, an one hour interview in order to fulfill the questionnaires regarding mood and personality (Owens, 2020).

5.1.7 The pharmaceutical approach as a tool to enhance socialization

Towards the enhancement of performance and human cognition the use of exogenous and endogenous chemical agents (Frenguelli, 2020) could be pinpointed. Stimulants like methylphenidate (used to enhance concentration), acetylcholinesterase inhibitors (used in the treatment of Alzheimer's to enhance memory), and modafinil (used to enhance wakefulness) (Racine and Dubljević, 2016) could be considered as a quick solution for reaching the corporate's aims.

New drugs are researched and invented, which focus in the alteration of human feelings, behaviors and judgments. They could be capable of improving social interactions or even improve the person's ethical thinking. Such future technologies should be considered with all their political implications. A research back in 2015 revealed that the use of non-invasive brain stimulation technique can enhance polarity-dependently or reduce cortical excitability (Sellaro et al., 2015, p. 892). This method could gain cognitive control over stereotypes activation reducing thus the person's feelings of prejudice. The technologies of neuro-alteration create a series of implications on how a person could be judged if their actions are a result of brain intervention. Any action that targets towards the modification of the individual's subjective view point has a social impact and raises concerns of ethicality. The performance enhancing behavior and coping strategies might be a determinant of psychoactive drug use and could lead to dependence in the workplace (Ngoundo-Mbongue et al., 2005), while their use in healthy individuals could raise ethical issues and will be a blow to corporate's reputation. Therefore, their use is not recommended.

Such practices yield pioneering processed which could be implemented towards HR development procedures. The insights from this field could lead the way towards high productivity, qualitative performance, thriving teams, well-functioning personnel, and profitable organizations. Companies which focus on possibility and independent thinking generation stimulate the psychological comfort and security while they provide inspiration and motivation. Ultimately, the employees will deliver the best results while been acknowledged, grateful and happy to do so. By embracing and advancing the company's culture they will be providing more than just the bare minimum, augmenting thus the capital of the industry. To enhance their commitment the HR practitioner should coach each employee to create their personal career roadmap, to create a long term vision (Beale, 2020) and find the way to accomplish their dream. This method will stimulate the personnel to break away from apathy and to find what skills are required to better achieve their professional ambitions. Nonetheless, when implementing neuro-tactics the practitioner must be highly

qualified and experienced to obstruct any unwanted side effects. Examples of neuro-practices will be presented in the following section.

5.2. Introduction to case studies

The constant mechanization of the modern world seems to intensify the extend between technology and human capital in terms of skill setting. In view of this reality, more and more corporations are creating mechanisms to profit from the technological advances and create new settings for their HR. Immersive educational experiences emerge while extra care is given to the surrounding environment in an attempt to minimize supplementary expenses and augment the brain capacities of the personnel. Resource efficient constructions in buildings are created and the employee's wellbeing becomes one of the centric points of organizational attention, sustaining thus the reputation of the company's culture and creating profits.

Technological programs are used to better organize teams, by connecting them and revealing the levels of progress each member accomplishes on each task. Furthermore, prioritization of tasks could be possible while interconnecting each department with the same program. This enables better staff coordination while teams are becoming aligned and highly empowered. Projects could be undertaken with confidence while routine procedures could be automated. This would allow the personnel to focus on more creative tasks and keep track of all the tasks while having a 360° view of the process. One such program is Monday.com which as its motto indicates empowers an organization to outperform. It is a platform where -under a certain fee- teams can stay aligned, communicate and collaborate, while providing a 360° overview of the employees' progress.

Apart from the most updated technologies, industries harness the latest available knowledge aiming to incorporate it into their settings. Neuroscience has been extensively used especially in the field of marketing from 2002 (Morin, 2011, p. 133). Today, practices from neuroscience are utilized in almost all continents except Antarctica (tipTOP insights, 2020). After the consumer's behavior the corporate interest has shifted to the processes of organizational management and particularly in the field of HR development. In the present segment the cases of Avis and Atrium 1 will be mentioned as examples of neuroscientific implementation in the industrial setting.

The case of Avis

Avis is an American car rental company headquartered in Parsippany, NJ, USA (Avis Corporate Profile, 2020). In order to gain agility and respond to market's changes this industry decided to transform its HR program and put the employees into the driver's seat to steer the company towards a more innovative future. The need for a clearer,

consolidated view of our workforce around the globe resulted in a simplification, more consistent, rapid and cost effective HR execution (2020b Accenture). The key focusing areas were the creation of a system which would cover incentives, talent-seeking practices and team building techniques.

The use of brain-powered strategies allowed the predictability and enabled the holistic observation of the corporate's functions. The personnel was able to access modern HR information and execute any query such as giving feedback on performance, creating goals or updating personal details, all in an improved workforce setting (ibid). On the other hand, managers were able to retrieve valuable insight and data on the performance and career goals of each employee across businesses and regions. The industry sifted its interest from sales-led to service-led approaches, and pursued employee-centrism by creating facilitator-led learning practices and platforms for the right skill enhancement and behavioral adaptation.

The case of Atrium 1

In the center of Warsaw's business district, Atrium 1, a 55-metre commercial building is located (ARUP, 2020). It is a structure designed to be resource efficient. The building utilizes "the relatively constant annual ground temperature under the building to provide cooling during summer and to pre-heat incoming air during winter" (World Green Building Council, 2014, p. 26). The result was to reduce the artificial lightning by 55%, whereas the use of water was reduced by 70% minimizing the total energy cost by 70% (ARUP, 2020). Green-certified working spaces can boost cognition by 26%, reduce sick days by 30% and increase sleep quality by 6% (JM electrical, 2018). Such settings enhance the chances of encounters between knowledgeable employees, while improving the wellbeing and the performance of the personnel. Such designs are already adopted by multiple corporations such as Amazon and Boston Exchange Coffee House and Hotel (BLDUP, 2020).

As it seems the private sector has already taken advantage of the latest insights in the HR development. Their practices augment the trust in leadership, combat absenteeism and staff turnover, while reduce medical costs and complaints, and enhance productivity (World Green Building Council, 2014, p. 16) and job efficiency.

The case of SAGE Therapeutics

Even though neuroscience is considered as a modern technique and a trend within the private sector, the utilization of its power in the realms of the public corporate settings is limited. The interest of most of the located public services is narrowed in down to biopharmaceutical medicines and their outcomes in the wellbeing of their clients, while neuro-practices are not implemented in their workforce. Information on their strategies on HR development is narrow with most of them referring to attractive

remuneration packages, discounts and inclusive environment (Roche, 2020), while promising to support the development of the personnel's potential (AstraZeneca, 2020) and referring that they pay great emphasis on their people and the collaboration amongst us by offering employee wellness initiatives (Amarin Corporation PLC, 2020) without giving any further details.

One of the public corporations that stood out from the rest is SAGE Therapeutics. It is a biopharmaceutical multinational company with its headquarters located at US - Cambridge, MA, USA. According to the corporate site, their aims focus in the improvement of brain health and developing novel therapies (SAGE Therapeutics, 2020a) for brain disorders. Concerning their HR management they claim to place the personnel at the centre of their progress and that they are committed to support their well-being while rooting for their balanced life outside the corporation (SAGE Therapeutics, 2020b).

Apart from healthcare, financial benefits and time offs this industry offers programs and resources to support the welfare of the personnel. Some of them include :

- employee assistance program for the amelioration of mental health,

- gym memberships,

- tuition reimbursement for those who pursue to expand their studies,

- personal assistance program designed to aid the personnel when managing priorities,

- regular breaks for employee's socialization,

- free chair massages

- free fitness classes (ibid).

Incentives like the ones mentioned before lead to better performance and employee engagement leading to effective public corporations. Such settings, allow governments to coordinate human action for the public interest (United Nations publication, 2005, p. v). The skills and integrity of the social servants are the lifeblood of the public service and the main source of its vitality and strength (ibid).

Apparently gradually trend from the neuroscientific field are expanding in the public sector. This timid adaptation in the HR development of public organizations will be explored in the next section.

6. Neuroscience in the Public sector: Urban Planning from public sector authorities

As technology advances neuroscientific methods becom more sophisticated. The progress in this field has captured the attention of politicians and policy makers. All governments are seeking voter data and insights that will propel them to victory (Randall, 2015), while considering developing an accurate measurement system of assessment for academia and governments (Villaseñor García and Puron-Cid, 2017) around the globe. For instance, synergies of neuroscience and the public sector could include the use of scientific information to design cities. A successful implementation will increase the quality of life of the cities inhabitants; reduce mental, physical and psychological health outbreaks (Camargo et al., 2018, p. 50). Such resolutions to psychogenic and corporal health issues in the urban environment are fundamental for economic growth.

Ever since humans have made the transition from caves to cities, the urban setting has become the epicentre of culture, politics and industry (ibid, p. 8), while manifesting movements and innovations throughout the centuries. Along with talented and peaceful people other malpractices coexist combined with stressors and pollutants which can affect not only the wellbeing of the inhabitants, but their genetic structure as well. The quality of life offered by the urban setting has stimulated the interest of policy makers and corporations, who seek to allure and retain talented people while preventing health risks in order to achieve the most cost-effective long-term strategy.

Applied neuroscience is a fast-growing field that could aid at the limitation of stressors such as sound, light, and air contamination. When exposure to such pollutants is constant, it can lead to negative repercussions for health, cognition, behavior and psychomotor disorders in humans (de Prado Bert, 2018, p. 362). More specifically, noise pollution has been associated with anxiety, depression, high blood pressure, heart disease, and stroke (Sheikh, 2018). On the other hand, exposure to air pollution is linked with harmful consequences on mental development and on behavioral functions such as attention, global IQ reduction, memory and academic performance declination, and augmentation of Attention Deficit Hyperactivity Disorder and Autism Spectrum Disorder (de Prado Bert, 2018, p. 351). Continuous or mistimed exposure to light can lead to resynchronization of biological and behavioral rhythms, physiological disruption, and mood disorders (Bedrosian and Nelson, 2017, p. 1). A solution to mitigate the effects of the environmental stressors (Camargo et al., 2018, p. 99) could be the limitation of unnecessary light at night, the use of hybrid electric cars and thicker insulation in homes and offices (Sheikh, 2018).

Successful institutions do not exist in a vacuum. Yet, public corporations have not given the adequate importance to the influence of the external environment on their personnel. Even though political and strategic aims can be met with the proper management of the public personnel, it seems that the skills and capacities of the public employees are not used to the fullest extent in many circumstances. Bearing this in mind, governments contribute substantial resources on the development of their staff through centrally funded institutes of public administration as well as other capacity-building programs (ibid, p. 28). However, they fail to secure sufficient return on their investments on HR development.

Presumably an adaptation of private sector's practices into the traditional notion of bureaucracy would result in tremendous positive outcomes in the wellbeing and performance of the civil servants, similar to the ones that the private sector pursues. Optimization of the conditions for their human capital development, employee engagement in the decision-making process and promotion of inclusion would allow the acquisition of the necessary creative and talented personnel to drive public corporations to successful paths. However, this benevolent point of view does not take into consideration the complex and unrushed gears of the public sector.

In order to even consider reforms, an analysis should be initiated to identify the areas which need amelioration. Social, cultural, political and economic characteristics should not be omitted from the investigation. After the decision for implementation is taken, public services should develop and adjust them gradually so that no contradiction occurs with customary laws that dictate the employees' behavior. Furthermore, before embarking on more complex initiatives a unified, merit-oriented career civil service should be institutionalized (ibid, p. 29). Finally, public initiatives could "hit a wall" due to the reluctance of the employees towards change. Apart from the hostility towards innovations and the opposition from strong unions, there might be an absence of political will to implement the necessary reforms or even if it exists fragmented political parties could obstruct the application of the policies (ibid, p. 31). Additionally, the public sector cannot follow closely the tactics used by the private industries because it is bound by strict rules which often limit the options for hiring, firing, or offering benefits to workers (Bandiera et al., 2017, p. 1). Furthermore, in order to attribute rewards, the existence of an accurate, transparent performance measuring mechanism is imperative.

The provided tangible and non-tangible incentives can attract talented personnel while improving the performance of the existing ones. Evaluation of the existing motivational stimuli is needed in order to locate areas of adjustment, while pilot-test should be enacted to verify that new techniques would be fruitful in the public setting. Those motivational practices should be noticeable, simple and based on the needs of each employee. During their implementation special attention should be given to

avoid the risks of rewarding undesired behavior or shifting the attention away from other important tasks not linked to incentives (ibid, p. 7).

The application of neural practices in the public sector is currently at an infancy level. It appears to be a limited amount of public corporations which utilize some of the latest techniques from the private industrial setting but they do not provide much details about their practices with the exception of SAGE Therapeutics. Alas, the incorporation of the knowledge of neuroscience could ameliorate the wellbeing of the citizens and public servant alike. However is the influence of the fundamental biological forces which shape the personhood a panacea to combat all corporate and human unpleasant outcomes?

The next chapter will present the concluding ideas while investigating any potential limitations in the application of neuroscience in organizational setting and more particularly in the HR development.

7. Methodology concerns, concluding ideas and discussion

Findings in the domains of neuroscience will help people to embark in a journey towards a better understanding of the consciousness and the encephalic functioning. New methods are discovered in order to resolve the limits of the previous ones, which will be briefly presented in this chapter, and new techniques allow more accurate interventions in the human brain. The foundations of the biological forces that mold behaviors, perceptions and way of life could be further exploited for the wellbeing of humanity and for combating maladies. The accumulated knowledge could be used in various settings of social life both in the public and private sphere. The provided information can be utilized within organizations to reach their aims while enhancing the personnel's satisfaction, engagement and productivity. Already private corporations are trying to implement some of the available techniques in an attempt to increase their profit and advance their innovative strategies. On the other hand, the public sector has remained behind waiting to learn from the success or failures from the neural enhancement techniques.

The importance of decyphering the abyss of the human brain has enacted ongoing initiatives in Europe as well as in USA, Japan and Canada (European Comission, 2020). The European union has launched in 2013 a project known as Future and Emerging Technologies (FET) Flagships, one of Europe's biggest ever research initiatives (ibid). It is designed to co-ordinate brain research across Europe while fostering global initiatives (European Brain Research Area, 2020), and it is considered as an investement to ameliorate the people's lives. However, is there a possibility that too much faith has been attributed to the mechanisms of neuroscientific method? Some scolars are puzzled whether the methods are flawless. In case that accuracy can be achieved in what extent can an individual intervene, monitor and influence another person's brain? The techniques from neuroscience however fascinating and intriguing may seem they still have an obscure side. Questions of ethicality and privacy arise and concerns are accumulated regarding the existence or non-existence of a legal framework which will protect the people in cases of malpractices.

Technical restrictions

Neuroscience also faces technical issues regarding its methods. First of all the studies require a living brain. To investigate human brains scientists have to rely on methods such as fMRI or occasionally during neural surgical procedures were the patient has allowed the placement of electrodes. This sample size is too small in order to reach a general conclusion about all human minds and certainty about the results is limited. This could lead to an overestimation of the effect size and low reproducibility of

results (Button et al., 2013), since properties of the whole are not always readily predictable by the simple sum of the properties of the parts (Cacioppo and Decety, 2011). What is more is that this is a laboratory based method were experiments are repeated before good information can be extracted from the scans, removing spontaneity from the task (Butler and Senior, 2007, p. 6).

Furthermore in order to research their hypotheses some scientists resort to conducting experiments to animals in captivity. This research often mutates genes in cells of different animals that seem relevant to the ones that humans have (Lieffa, 2013). The issue arising from this practice is two-fold. Firstly, animals in captivity differ from the ones in the wild and secondly comparison with activity in human brains is speculative (ibid) since animal intelligence and human intelligence differ with some animals demonstrating high intelligence and sometimes superior capacities from humans (Lieffb, 2013). The differences between the species are likely to be significant, from different types of neurons, to distinct gene expression and fundamentally different capabilities of glial cell (Thiagarajan, 2019).

Other obscure methods include the use of neuroimaging which sometimes they present certain restriction regarding their experimental scope. Apart from the fact that there are matters of high cost (Turner, 2016, p. 6) and training issues, as a measurement it can only capture a clear image when the person lays still with his head surrounded by the magnet (Robinson, 2004, p. 715). This environment poses significant barriers concerning the kind of research that can be conducted, especially when the researcher is investigating social interactions. Biomechanical constraints influenced task performance (Qu et al., 2018, p. 1) and have a significant impact on cognitive functions that pertain action. Even if that drawback was combated there is a propability of false positive results during brain scans. An instance where this occurred was back in 2009 when researchers conducted a routine procedure in an Atlantic salmon which was not alive at the time of scanning (Bennett et al., 2009, p. 1). The fMRI scanner measured brain activity in a dead fish and illustrated why it is essential to apply statistical corrections when an experiment involves multiple tests (Oxenham, 2016). If corrections are not applied, multiple researched questions could result in increasing the likelihood of such false positives (ibid).

Another methodological issue is that fMRI detects changes in blood flow around the brain, and therefore only measures brain activity indirectly (Costandi, 2015). At the current moment it seems unlikely that fMRI will ever detect the activity of individual neurons, and so its ability to dissect the “fine structure” of thought is inherently limited (Robinson, 2004). Similarly, the measurements of the brain activity from all the available functional imaging modalities are indirect; “they measure surrogate biomarkers of neuronal activity like oxygen consumption (fMRI), glucose consumption or metabolism (PET), electric activity (EEG)”, or magnetic fields

(magnetoencephalography, MEG) (Racine and Dubljević, 2016). Additionally, its measuring may be proven challenging to interpret. Correlations of brain activity patterns with behavior do not prove causality, while the absence of activity in another brain region does not imply its lack of involvement in the function (Whitten, 2012).

Since neuroscience is advancing, setbacks in the use of its tools and methods will be little-by-little encountered. The comprehension of the human mind will be further amplified. The updated knowledge in the field might require former interpretations of scientific results to be revised. Scientists need to seek constant information regarding the developments of the academic sphere which are interested and amend their past assumptions and interpretations correspondingly. An example of the scientific readjustment can be drawn from the perception of the amygdala. It was believed that the amygdala was the home of fear in the brain (LeDoux, 2015). It was a simplistic conclusion deriving from a study on a subject with damaged amygdala, which did not respond to threatening stimuli. Nonetheless, they are now considered as a complex system responsible for monitoring the environment, modulating vigilance (Whalen, 1998) and memory, and having the ability to coordinate the behavioural, endocrine and autonomic responses that form an integrated emotional response (Killcross et al., 1997).

Most of the researchers are focusing on neurons and their activity. The importance of neurons was considered so fundamental that the science itself was named after them. However, the human encephalon has other cell types as well. One most commonly found is Glia. Glia are cells which originally thought to be supporting cast of the nervous system responsible for the chemical environment of the brain and for removing the debris from dead neurons (Brown University courses, 2020). New evidence show that Glia play a significant role in influencing the nervous system by supporting neuronal functions and actively communicating with neurons and with one another (Stevens, 2003, p. R469). New research points toward a critical role for glia also in synapse formation (ibid, p. R471). Evidently the brain functions are no longer considered as an outcome of neuron-to-neuron communication. New dimension in the study have been added shifting the interest away from neurocentric perspectives (ibid, p. R472).

Another danger lurking around while conducting research in the domain of neuroscience is the probable imprint of biases within the study. This potential distortion of study outcomes can be done even unintentionally by the silent invasion of biases. “Bias is any trend or deviation from the truth in data collection, data analysis, interpretation and publication which can cause false conclusions” (Simundić, 2013, p. 12). A downside of that sort is the existence of cognitive biases, which are often a result of the brain's attempt to simplify information processing (Cherry, 2020). They are considered as the unconscious acts of interpreting new

evidence in ways that confirm one's existing belief system or theories; this type of bias impacts how information is gathered, interpreted, and recalled (ATCC, 2020).

A drawback in selection criteria could be that they are not adequately randomized. This can be the result of a non-properly designed research with either small sample sizes or by not ensuring representative specimen. These indicative setbacks can infiltrate into the study and wreak havoc to the extent that the whole research will be eroded and the results will no longer be credible. Even though the possible absence of objectivity and the superfluous reductionism can be combated with a carefully designed experimental method and a cautious interpretation of the data (Robinson, 2004) via a thorough comparison on existing theories and epistemological evidence, ethical concerns can sneak into the scenery of neuroscience.

Ethical and philosophical implications

The field of neuroscience seems intriguing for scientists and society alike due to the promising aspects that withholds. People tend to believe that the interdisciplinary research of neural activity will shed light in all aspects of cognition revealing inner motives and predicting behavioral manifestations. Others fear of a grim future were neuroscientific findings will act intrusively into the individuals' minds in the name of constant amelioration. Furthermore, there is a danger that neuroscience might head to a road of biological reductionism (Butler and Senior, 2007, p. 6) were even free will is questioned as a product of past experiences and biological urges which are consciously uncontrollable (Henry and Plemmons, 2012). People will no longer be held responsible for their actions, since self-determination will be considered a myth (Butler and Senior, 2007, p. 6).

Social inequalities

Practices pertaining in the fields of neuroscience can potentially aggravate the division of social classes and promote further societal inequalities. This can be done due to the fact that the application of the developments from this domain could be proven costly. Thus, any therapeutic advances might lead to attempts to enhance normal function among those who can afford it (Cheung, 2009, p. 397). This could result in enhancement of capabilities and will provide a considerable advantage in the educational and occupational arena. Such enhancers could also be transformed into cheating mechanisms during competitive situations or test taking (Sahakian and Morein-Zamir, 2011, p. 200).

Other techniques from neuroscience promise to minimize wasting resources into training and wrong hiring by identifying the potential of each candidate and their eligibility through brain mapping. However, can this lead to discrimination tactics within the workforce? Will neural deficiencies be characterized as disabilities and

what measures can be taken to avoid stigmatization? Additionally since life style choices and environmental factors affect cognition people who grew up in low classes would have a considerable disadvantage. Given the fact that poverty influences development of cognitive and emotional regulation (Lipina and Evers, 2017, p. 1); there is a probability that selection from low-classes might be depleted, contributing in the enhancement of inequality in society. Perhaps a merge of methods from HR and neuroscience could limit the possibilities of malpractices.

The question that rises is whether the intervention for the improvement of cognition, behavior or mood would be based on a psychiatric evaluation or whether it would be based on desire and will be available in the market as a sort of "cerebral plastic surgery". As any scientific intervention an encephalic enhancement includes health risks and a probability of long-term side effects. Endangering oneself only to simply augment the performance above a normal baseline (Stanford Encyclopedia of Philosophy, 2016) can be considered unreasonable. Furthermore, such mental shortcuts will diminish the importance of real effort and will render meaningless the process of striving for success, since the end result could be accessible in the market. With the use of the available improvement techniques the person will no longer be able to take credit for its achievements.

Concerns regarding the individual's privacy and autonomy

In the labour setting concerns could revolve around the fact that employees could be coerced into using enhancement techniques. Tactics as such may be followed in case the company needs its workers to be alerted while working during the night or when the provided incentives tempt the employee to use the promising optimization shortcut that may lead to success. Moreover, when corporations are implementing brain techniques such as the one of mindfulness they might trigger unintended consequences. Bearing in mind that the specific method enhances the person's capability of controlling its inner thoughts and behaviors, while being more aware of its personal goals and values (Glomb et al., 2012), there is a probability were a mindful staff member decides to favoring his personal interests over the organizational ones. The human mind is not a playground. A wrong move could result in reverse effects and can have devastating results due to the crucial and sensitive parts of the body involved (Reese, 2016).

An additional concern could be whether a fundamental right, which is protected by the Article 18 of the Universal Declaration of Human Rights and Article 18 of the International Covenant on Civil and Political Rights (United Nations, 2003, p. 522), will be challenged. Freedom of thought is guaranteed by multiple legal provisions. However, advances in neuroscience can pose a threat in the individual's privacy and autonomy. The content of the cranium is separated from the external environment

and elusive from monitoring unless the person voluntarily agreed to be examined. Even though current technology does not support an imaging method that would allow the distant examination of a subject[12], there is a possibility of creating a reliable distant method of extracting the content of conscience in the near future.

A threat to civil liberties and privacy could be made through the potential predictive power of neuroscience for future behavior. Prediction through neuroscience revives unsettling evocations of an era "when phrenologists used body proportions to make pronouncements about a person's intelligence, virtue", and -in its most extreme iteration- racial inferiority (Calderon, 2018). In essence, predictive neuroimaging could be used to provide information about an individual's likelihood of recidivism (Stanford Encyclopedia of Philosophy, 2016). Will the state act preventively by detaining people on the grounds of those predictions and based on the likelihood of them committing a crime? Will they force parts of the population to follow a "corrective" program to modify areas that are perceived as problematic or will it stand by and let the alleged crimes been carried out? Who will make those decisions?

Threats for personhood

Another emerging issue is that neuroscience may change personhood. Persons are perceived as embodied entities that have their own identity, integrity, independence, or self-sufficiency (Sapontzis, 1981, p. 607). Due to the fact that interventions from neuroscience are already able to affect among others memory, desires, personality, mood, impulsivity (Stanford Encyclopedia of Philosophy, 2016), there could be a possibility where the constructive components of the self are changed in an extend that might affect the connotation and qualitative characteristics of the most cherished features of the individual's life, and ultimately change the person itself. Again the question echoes its way through. How far will these methods be allowed to enter the person's minds and in what extend can they make amendments? Will humanity enter yet again in an era where the amelioration of human kind, as it is perceived by stakeholders, will be pursued? Perhaps the motives for the developments in the field are kind-hearted, but these interventions and manipulations are subject to the influences of the market and political direction (Giordano, 2017).

Hazard of neuropharmaceutical misuse

To this day, several methods have been developed in order to measure and assess mental states without the need of the other person's verbal or non-verbal external expression to mental states without the need of the other person's verbal or non-verbal external expression (Evers and Sigman, 2013, p. 1). Apart from the risks

[12]Disclaimer: such method exists and it is called Near InfraRed Spectroscopy. However, the provided information is crude and unsuitable for decoding mental content (Stanford Encyclopedia of Philosophy, 2016).

deriving from the methods which monitor the neural activity, there is the hazard of neuropharmaceutical misuse. These types of enhancement have not yet been fully tested in healthy brains and the knowledge surrounding the long-term use (Racine and Dubljević, 2016) is narrow. They could be used as a life-style choice, and potentially create dependence if used constantly. One example of how the limited knowledge on drug use can create harm can be subtracted from history. It was the case of cocaine, a tropane alkaloid that was used for its mood elevating effects and as a central nervous system stimulant (National Center for Biotechnology Information, 2020). It was highly advertised at its time as a way to restore health and vitality, while Freud himself wrote a paper praising this substance for its properties, ignoring its addictive features (History, 2017).

Innovations within the realms of neuroscience are been implemented in medicine, public life and in various other aspects of social life. Numerous tools and methods are been generated while queries are raised concerning the impact of the accumulated neuroscientific knowledge on social life and regarding the ways which those practices will be implemented. Even though these advancements are possibly done for benevolent purposes, such as the amelioration of human health, the prevention of neural degeneration and confrontation of illnesses, the better understanding of the human mind can clear a path towards malpractices and attempts of control.

Conclusions

The insights from neuroscience and its applications in the field of HR are still in early stages. However, since many countries are involved in the promotion of its researches by arranging funded projects to accumulate scientists into the investigation of cerebral human capacities, the knowledge of the field will be gradually augmented. Already neuroscientific practices are implemented within organizational settings mostly in the private sector, with a few exceptions existing in public corporations. Biological potencies, deriving from genetics, hormones, neurology, body and evolution, which mold behavioral expressions, interests and values, are under the umbrella of scientific and organizational interest.

Innovative corporations are adopting new methods which place the employees at the center of their strategies by developing mechanisms to enhance their knowledge, qualifications and capacities. New methods are incorporated in order to combat the stressors in the workplace, augment the personnel's wellbeing and inspire the human capital to innovate while been dedicated to the corporate family. The promising field of brain studies intrigues the stakeholders, while more and more techniques are been adopted. Diverse forms of evaluation are created to supplement the existing ones, while corporations aim to enhance the employees' mental possibilities, performance and retention by providing incentives, such as educational opportunities, physical

exercises and healthy nutritional choices. The colossal opportunities deriving from brain strategies pledge to increase corporate revenues and be benefited for the reputation of the company and steer the business into successful paths.

The apprehension of all the external contributing factors can help in the design of the working environment in order to retain the employees' attention span, and promote effective communication. Smarter approaches are incorporated by taking into consideration the cultural and educational background of each individual. By understanding the importance of emotions in the decision-making process, and by incorporating strategies of influence companies can reach end results and influence their personnel towards the desirable behaviors and practices through strategies of repetition.

By utilizing plans of actions focused on encephalic features, corporations will be enabled to predict future employee actions, while been able to monitor all the stages of productivity both in real-time and in future scenarios. Other advantages of such practices will be the acquisition of unfiltered neural feedback and the identification of each employee's needs and career goals. A proper goal setting by the use of S.M.A.R.T. techniques and motivation will fight procrastination, the enemy of progress. Additionally, the use of SCARF model could be one of the practices that could defeat resistance to change, a mechanism engraved in each person's survival instincts.

Evidently the corporate world and public administration not only have taken notice of the intriguing interplays between the corpus and the workplace, but have already attempted to implement the most updated methods in HR development in order to increase job efficiency. Indeed, in most cases absenteeism is apprehended, leadership is trusted and overall wellbeing is increased, with the sentiment of belonging augmented and with medical costs reduced. Although, it seems to have positive outcomes in the private arena, the public sector appears to be reluctant while an implementation of neural practices within its organizations is still in early stages. Globally there are a few exceptions to the general rule but information regarding their practices is limited.

The will for change might exist, but the public sector moves slowly in order to be certain that the strategies will bring the desired results. The public sphere is resistant to experimentation within its practices since there is little room for acceptance within the community. It has to follow the written and customary laws and consider all the parameters. Also, strong syndicates can create huge obstacles in their attempt to secure the civil servants from the upcoming threat of change. Finally, few governments are willing to take all the necessary actions towards the organizational tactics re-arrangement so that no voter is displeased and no additional funds are spend

for the training and adaptation of the new methods. The field of neuroscience offers smarter approaches in the workforce and boosts its mental capacities by maintaining it active. The aptly targeted incentives, the learning possibilities, the feeling of inclusion and the increasing corporate reputation are some of the benefits that these practices promise. However, any changes in the public sector have to be introduced with the appropriate governmental bill and updated guidance should be provided following the ministerial initiatives.

Additionally, even though a positive impact of these practices exists, there are still not enough evidences concerning the safety of these techniques on healthy brains. Professional misconduct exists as a repercussion, while misinterpretation of the data, statistical errors and absence of the possibility of replicability are possible. Moral concerns are acting as a warning towards an alarming future where the creation of a superior race will be pursued. In that scenario, violation of freedom of thought will be possible and social inequalities could be aggravated. Devastating effects could be manifested where the notion of accountability will no longer apply. Mechanisms of neuroscience could be used to enforce the proletariat into cognitive enhancement endangering its mental health and forcing it to be constantly occupied in the industrial setting. In the end, the knowledge of neuroscience as well as the existing and future methods is just a tool. It is up to the person responsible for their application if they decide to use them for the maximization of wellbeing or the manipulation of the masses.

The present research has briefly examined the impact of cerebral mechanisms on the organizational setting, giving extra emphasis in the human development processes. It has been suggested that emotions play a pivotal part in the perception of the world affecting both memory and temper. The frame of mind is also set by personality, education, level of attention and culture. In order to be able to control or be aware of attempts of manipulation one must be self-conscious and have elevated emotional intelligence. Furthermore, the in depth understanding of theories is required so that the tools of handling become apparent and available for usage in multiple fields, such as HR development or city design.

Discussion

The promising field of neuroscience provides a universal remedy for multiple fields and more particularly in the field of HR management. However, since there are continuous developments its findings should always be critically revised and its results should always be readjusted and compared with the existing theories before been adopted into corporate settings. Its methods should always be practiced by specialized personnel that understands the moral and ethical repercussions that hinder at the implementation of the knowledge from the scientific domain which is located at

the intersection of cognitive, societal and neural realms. These specialists should intervene only if needed, after a psychiatric evaluation, and be able to avoid or reverse any side-effects which may occur. Before proceeding with the use of its practices potential harm must be balanced with the potential benefits, while the person's autonomous decision-mechanism should be respected (Shrivastava and Behari, 2014). A constant question should be present in the minds of scientists and practitioners: just because they can create a method of influence, should they do it?

Regarding the neuropharmaceutical advancements, people should remain skeptic and consult a doctor in case they need to use them for medical purposes. They should also wait for proper clinical trials to take place first. Finally, in order to avoid any malpractices the stakeholders should consider creating a legal framework to monitor and control any dark deviations.

This study attempted to link some of the neuroscientific aspects with the processes of HR development, while essayed some indicative tools and methods from the field; however, a more thorough investigation is required. "Social neuroscience is becoming an expertise with social vocation, claiming the capacity to provide an objective knowledge about key features of human social conduct and of human pathology" which can and should underpin interventions (Rose and Abi-Rached, 2013, p. 160). This blend of psychology and neuroscience withholds a lot of secrets ready to be unlocked by thorough investigation. This interesting voyage is full of opportunities and challenges. Nevertheless, neuroscience is here to stay and with its progress, humans might evolve for the better or for worse.

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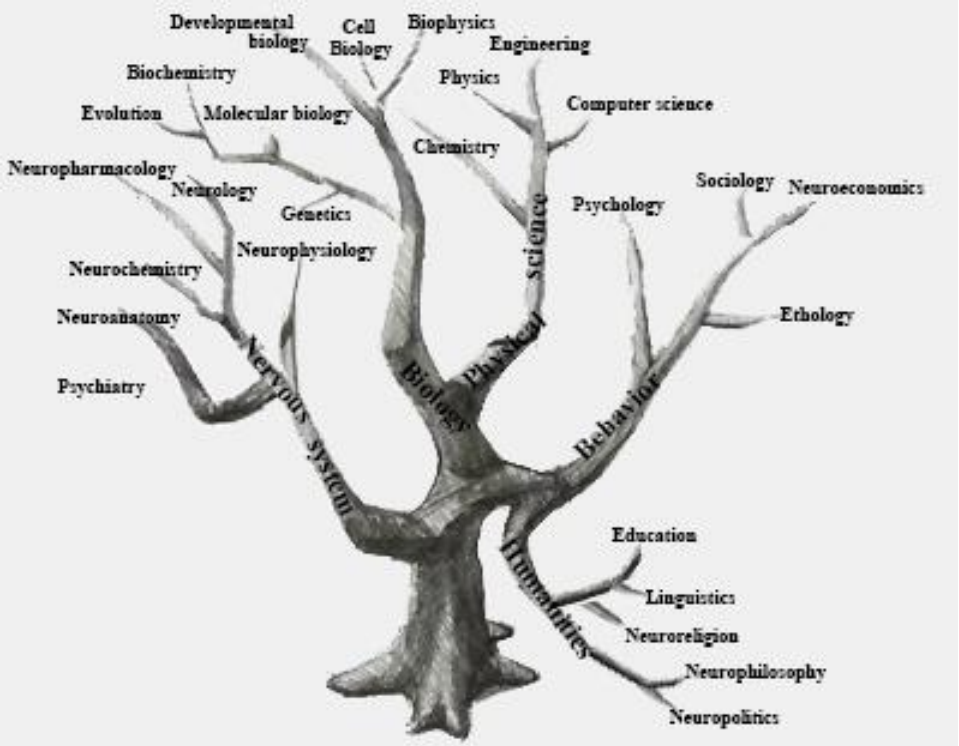
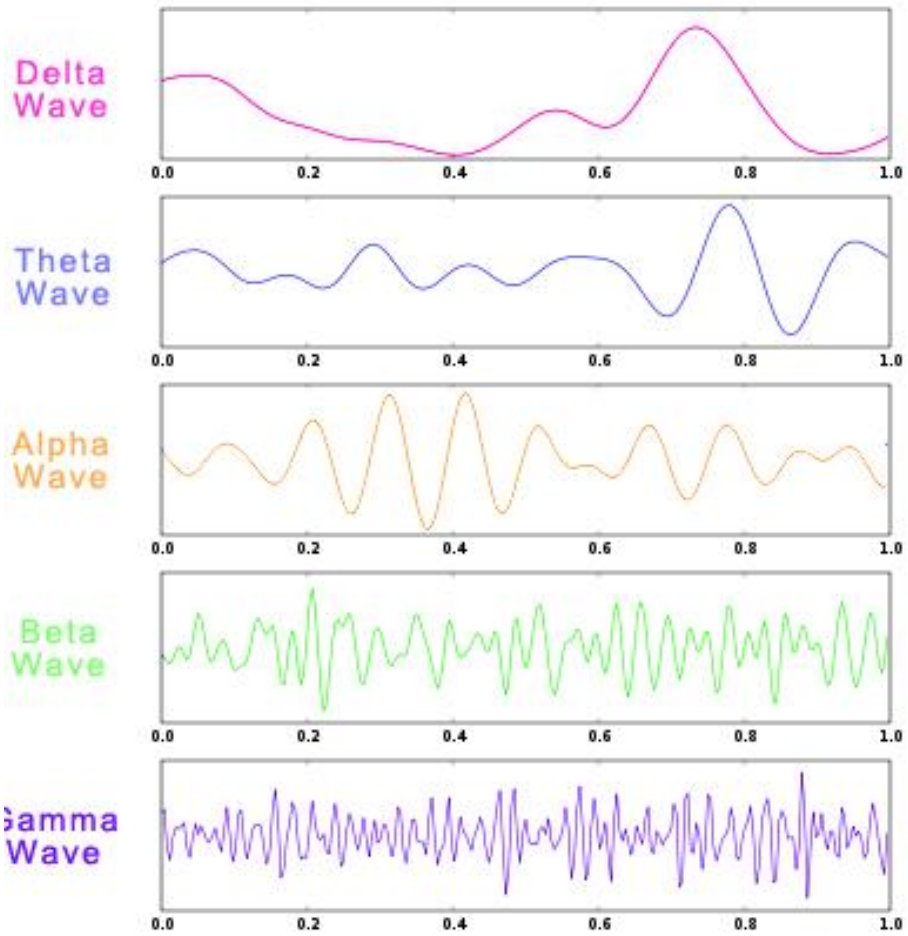
Appendix

Table II. Universal emotional states.		
Core emotions	**Responses**	**Biology**
Fear Anger Disgust Shame Sadness	Survival Escape/avoid/fright/fight	Stress cortisol
Startle/surprise	Survival/attachment	
Excitement/joy/trust/love	Attachment Wonder Growth	Dopamine Noradrenaline Serotonin Oxytocin



Branches of Neuroscince and Academic fields



The illustration of normal ranges of these brainwaves as perceived by a normal healthy brain

Source: https://itsusync.com/different-types-of-brain-waves-delta-theta-alpha-beta-gamma

Elements from neuroscience which boost productivity and ameliorate workplace	
Natural light (both natural and artificial)	•positively affect mood, performance and productivity
Indoor air quality (Proper ventilation)	•Prevent diseases •positively affect mood, performance and productivity •stimulate creativity, sense of purpose, and focus •job satisfaction •increase attention span, reduce mental fatigue
Right color selection	•enhance performance and space appraisal •may promote calmness and happiness •affect feelings, attention, and behavior •Depending on color it may improve concentration (green), increase the perception of comfort and improve neural functioning (orange) and may enhance productivity (blue)
Open-plan layout	•Promotion of collaboration (face to face interaction. In practice it creates social withdrawal from team members)
Acoustic environment (Recommended sound level ≤45 dB(A))	Can either promote or inhibit productivity and well-being. Use of music can •enhance creative expression •amplify cognitive functions •promotes coordination •support learning capacities •heightened level of alertness in processing, concentration, arousal, and cognition (beta brain waves) •stress-free environment and heightened alertness (alpha brainwaves) •promotion of memorization capabilities, reduction of fear, augment capacities of problem solving and creativity (theta brainwaves)
Comfortable furniture	can prevent health issues, which are linked to abnormal strain of the neuromuscular system
Thermal conditions	The perception of thermal comfort is subjective •Satisfaction. •affect concentration, clear thinking and self-estimated performance
Physical exercise (30 min/day)	•amelioration of productivity, the overall performance, and the alleviation of stress responses •stress reduction •catalyzer against neurodegeneration •promotion of social, somatic and intellectual performance •promotion of health

This is a proposed guidance sheet for tenants (and potential owner-occupiers) seeking new space, in the form of a list of questions to raise with the landlord's letting or sales agent.

It deliberately poses questions that it may not be possible to answer easily at the moment, but serves to provide a steer for the direction we believe discussions are likely to go in, in the future. It therefore should prove instructive to landlords as well who may want to stay ahead of the curve on this issue and be better prepared to handle questions from prospective investors/occupants.

Indoor Air Quality

Tenant to ask if it is possible for the landlord to provide the following information (or to allow their own technical assessment):

- What level of particulates is present in the indoor air in the tenants' demise?
- What systems do the buildings have in place to filter outdoor/indoor air?
- What CO_2 levels are present in the indoor air in the tenants' demise?
- What VOCs levels are present in the indoor air in the tenants' demise?
- What CO levels are present in the indoor air in the tenants' demise?
- What NOx levels are present in the indoor air in the tenants' demise?
- How easy is it to fit monitors to existing systems to allow for monitoring?

Thermal comfort

- What is the source of ventilation for the building?
- What is the ventilation rate for the building?
- What are the temperature set-points for the HVAC system?
- What is the level of relative humidity in the tenants' demise?
- What is the level of personal control in the tenants' demise?
- Is there a record of physical complaints and can this be viewed?

Lighting

- Does daylighting meet industry standard lux levels for specific tasks, to allow artificial lighting to be switched off around desk areas for the majority of the working day?

  Where the landlord has installed the lighting:
- What type of lamps have been installed and what is their predicted annual energy consumption?
- What is the lamp colour temperature?
- Please provide lux levels for the demised space.

Biophilia

- What is the provision of green space adjacent to the building?
- What is the nature of the provision of planting in common areas?
- What are the external views of, and are there views of trees and green space from the building?

Design including active design

- Please provide photographs to illustrate the design character & brand ethos – incl. colour, shape, texture & art
- What is the provision of cycling facilities in the building (bicycle racks, showers, drying rooms, lockers)
- Does the design of the building encourage the tenants to use the stairs rather than the lift?

Amenities & location

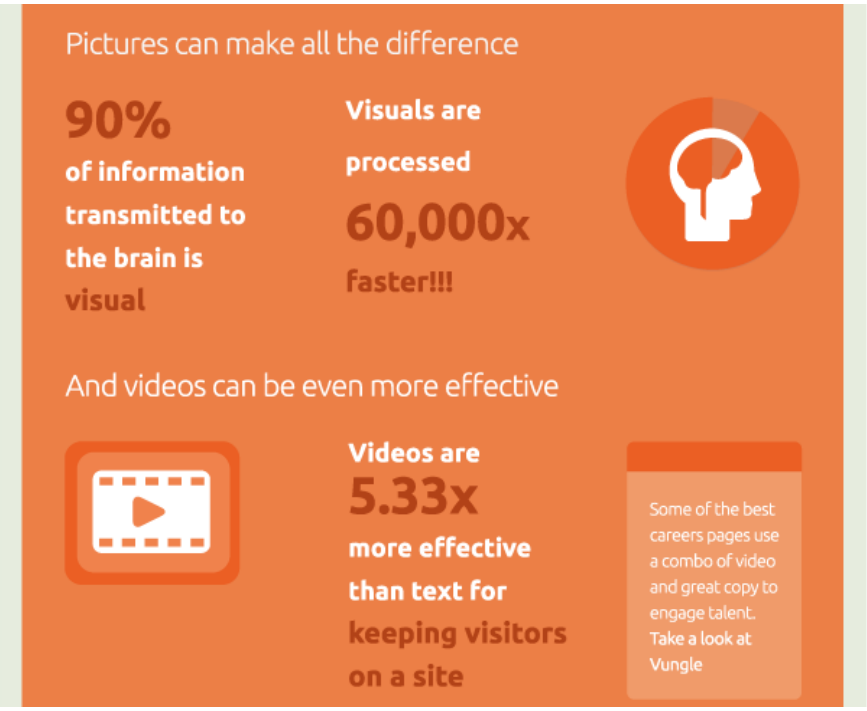
- Describe public transport provision within ten minutes walk of the building
- Describe the services available local to the building (e.g. shops; restaurants; post office; leisure facilities; healthcare facilities; childcare)
- Describe any services within the buildings, e.g. canteen, onsite childcare facilities, gym, laundry/dry-cleaning service, etc.
- Describe the local public realm in terms of standards of maintenance and perceptions of personal security, and please provide photographs to illustrate aesthetics
- Are there any communal spaces conducive to interaction with colleagues (and people from adjacent enterprises)?

Post-Occupancy Evaluation

- Has the building/space undertaken POE studies?
- Are these able to be reviewed?
- Beyond energy, does the building/space publicly report other areas of environmental performance, including IEQ indicators?

Guidance for tenants

World Green Building Council, 2014, p. 86



Importance of visual stimuli

Source: https://beamery.com/blog/influence-candidates